

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
1	AlPO <sub>4</sub> +5 wt% MgF <sub>2</sub>	1450	Orthorhombic	3.0	900	5.8	–	1
2	50%Li <sub>2</sub> CO <sub>3</sub> -40.24%B <sub>2</sub> O <sub>3</sub> -9.76%SiO <sub>2</sub>	600	glass	3.2	10500		–79	2
3	SiO <sub>2</sub> sol-gel	1550	Tetragonal cristobalite	3.5	92400		–15	3
4	0.2B <sub>2</sub> O <sub>3</sub> -0.8SiO <sub>2</sub>	1100	Amorphous (fused silica)	3.6	70600			4
5	SiO <sub>2</sub> (solid state method)	1100	fused silica	3.7	44300		–15	5
6	SiO <sub>2</sub> melt method		Fused silica	3.7	122100			5
7	10.5CaO-22.2B <sub>2</sub> O <sub>3</sub> -67.3SiO <sub>2</sub>	1035	Glass	3.8	4300	12.9		6
8	SiO <sub>2</sub>	1650	Trigonal P3 <sub>1</sub> 21	3.8	80400		–16	7
9	CaO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> (29.3:9.3:61.4 mol%)	900	Glass	3.9	1800	9.9		8
10	27.8CaO-27B <sub>2</sub> O <sub>3</sub> -45.2SiO <sub>2</sub>	875	Glass	4.0	3200	12.8		8
11	KGaGe <sub>3</sub> O <sub>8</sub>	890	Monoclinic P2 <sub>1</sub> /a	4.0	10200	13		9
12	SrCuSi <sub>4</sub> O <sub>10</sub>	1100	Gillespite Tetragonal P4/ncc	4.0	11500			10
13	CaO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> (19.8:30.9:49.3 mol%)	900	Glass	4.1	2000	9.9		8
14	CaO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> (10.5:22.2:67.3 mol%)	900	Glass	4.1	2600	9.9		8
15	Na <sub>2</sub> MoO <sub>4</sub>	660	Cubic Fd-3m	4.1	35000		–76	11
16	Li <sub>3</sub> AlB <sub>2</sub> O <sub>6</sub>	650	Triclinic	4.2	12460	16.8	–290	12
17	27.8CaO-27B <sub>2</sub> O <sub>3</sub> -45.3SiO <sub>2</sub>	850	Glass	4.2	3200	12.8		6
18	LiAlSiO <sub>4</sub> +15 wt% Bi <sub>2</sub> O <sub>3</sub>	900	$\alpha$ -eucryptite Rhombohedral R3	4.3	62400		–16	13
19	Li <sub>2</sub> CaSiO <sub>4</sub>	1000	Tetragonal I-42m	4.4	2500			14
20	BF33 glass	–	Glass	4.6	440	4		15
21	BF33 glass	–	Glass	4.6	860	5		15
22	BF33 glass	–	Glass	4.6	2900	24		15
23	BF33 glass	–	Glass	4.6	4560	77		15
24	Mg <sub>2</sub> Al <sub>4</sub> Si <sub>5</sub> O <sub>18</sub> Indialite recrystallized	1320	Hexagonal P6/mcc	4.6	207800	19	–27	16
25	MEMPAX glass	–	Glass	4.7	310	2		15
26	MEMPAX glass	–	Glass	4.7	700	5		15
27	MEMPAX glass	–	Glass	4.7	2400	24		15
28	MEMPAX glass	–	Glass	4.7	5130	77		15
29	K <sub>0.9</sub> Ba <sub>0.1</sub> Ga <sub>1.1</sub> Ge <sub>2.9</sub> O <sub>8</sub>	990	Monoclinic C2/m	4.7	10600	13	–18	9
30	LiAlSiO <sub>4</sub>	1350	$\alpha$ -eucryptite Rhombohedral R3	4.8	36000		8	17

31	$\text{Li}_3\text{AlB}_2\text{O}_6$	700	Triclinic	4.9	12600	16.9	-201	12
32	(cordierite) $\text{Mg}_2\text{Al}_4\text{Si}_5\text{O}_{18}+7 \text{ wt\% Yb}_2\text{O}_3$	1420	Orthorhombic Cccm	4.9	112500	18		18
33	$\text{Li}_2\text{MgSiO}_4+5 \text{ wt\% LMZBS}$	850/2h	Orthorhombic	4.9	8000	8		19
34	$\text{Zn}_2\text{SiO}_4\text{-SiO}_2\text{-H}_3\text{BO}_3$ (30:55:15 wt%)	725		4.9	38100	18.49		20
35	$\text{SrCuSi}_4\text{O}_{10}+5 \text{ wt\% LMZBS}$	900/6h	Tetragonal Gillespite P4/ncc	5.0	4000			10
36	30 wt% $\text{Al}_2\text{O}_3+70 \text{ wt\% [3ZnO-2B}_2\text{O}_3]$	850	Composite	5.0	8000	7	-32	21
37	$\text{Mg}_2\text{SiO}_4+15 \text{ wt\% LBS}$	950	Orthorhombic Pbnm	5.0	1500			22
38	$\text{Li}_2\text{MgSiO}_4+3 \text{ wt\% LMZBS}$	850/2h	Orthorhombic	5.0	10000	8		19
39	$\text{SrCuSi}_4\text{O}_{10}+3 \text{ wt\% LMZBS}$	975/6h	Tetragonal Gillespite P4/ncc	5.1	5000			10
40	$\text{Li}_2\text{MgSiO}_4$	1250/2h	Orthorhombic	5.1	16000	8		19
41	Cordierite+15 wt% $\text{CaO-B}_2\text{O}_3$	1020	Cordierite composite	5.1	4500	10.3		23
42	$\text{Li}_2\text{MgSiO}_4+3 \text{ wt\% LBS}$	850/2h	Orthorhombic	5.1	42100	8		19
43	$\text{Li}_2\text{MgSiO}_4+2 \text{ wt\% LBS}$	850/2h	Orthorhombic	5.1	67000	8		19
44	AF32 glass	—	Glass	5.1	360	1		15
45	AF32 glass	—	Glass	5.1	290	4		15
46	AF32 glass	—	Glass	5.1	1190	5		15
47	AF32 glass	—	Glass	5.1	3470	24		15
48	AF32 glass	—	Glass	5.1	7230	77		15
49	$\text{KGaGe}_3\text{O}_8+0.3 \text{ wt\% H}_3\text{BO}_3$	880	Monoclinic $\text{P2}_1/\text{a}$	5.2	64000	13	-23	9
50	$\text{Li}_2\text{MgSiO}_4+5 \text{ wt\% LBS}$	850/2h	Orthorhombic	5.2	12500	8		19
51	$\text{Li}_2\text{MoO}_4$	Room Temp	Trigonal R-3	5.2	18500	9.6		24
52	$\text{LiAlSiO}_4+12 \text{ mol\%B}_2\text{O}_3$	950	$\alpha$ -eucryptite Rhombohedral R3	5.3	212000		-8	17
53	$\text{Li}_2\text{MgSiO}_4$ citrate gel method	1175	Orthorhombic	5.3	9000	9		25
54	$\text{K}_{0.9}\text{Ba}_{0.1}\text{Ga}_{1.1}\text{Ge}_{2.9}\text{O}_8$	910/20h	Monoclinic $\text{P2}_1/\text{a}$	5.3	148100	13		9
55	$\text{SrCuSi}_4\text{O}_{10}+1 \text{ wt\% LMZBS}$	1075/6h	Tetragonal Gillespite P4/ncc	5.3	6500			10
56	sillimanite ( $\text{Al}_2\text{SiO}_5$ )	1525		5.3	37500		-17	26
57	$\text{Li}_3\text{AlB}_2\text{O}_6$	775/10h	Triclinic P-1	5.4	20450	17.4	-244	12
58	$\text{Li}_2\text{MgSiO}_4+0.5 \text{ wt\% LBS}$	925/2h	Orthorhombic	5.4	80000	8		19
59	40 wt% $\text{Al}_2\text{O}_3+60 \text{ wt\% (SiO}_2\text{-B}_2\text{O}_3\text{-Al}_2\text{O}_3)$	875	Composite	5.4	8000	—	-50	27

(continued)

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60	0.85SiO <sub>2</sub> -0.15TiO <sub>2</sub> core shell structure	1200	Composite	5.4	40500		0	28
61	Zn <sub>2</sub> SiO <sub>4</sub> -SiO <sub>2</sub> -H <sub>3</sub> BO <sub>3</sub> (33:59::8 wt%)	825		5.4	48800	17.7		20
62	Zn <sub>2</sub> SiO <sub>4</sub> -SiO <sub>2</sub> -H <sub>3</sub> BO <sub>3</sub> (33:59:8 wt%)	875		5.5	40500	17.49		20
63	NaAlSi <sub>3</sub> O <sub>8</sub> (albite)	1025	Triclinic C-1	5.5	11200		-5	29
64	Li <sub>2</sub> MoO <sub>4</sub>	540	Trigonal R-3	5.5	46000	13	-160	30
65	Li <sub>2</sub> MgSiO <sub>4</sub> +1 wt% LBS	925/2h	Orthorhombic	5.5	114300	8		19
66	Li <sub>2</sub> MgSiO <sub>4</sub> +0.5 wt% LMZBS	925/2h	Orthorhombic	5.5	72700	8		19
67	CaO-SiO <sub>2</sub> -B <sub>2</sub> O <sub>3</sub> +0.5 wt% ZrO <sub>2</sub>		Composite	5.5	28500	11.1		31
68	Li <sub>2</sub> WO <sub>4</sub>	640	Monoclinic C2/c	5.5	62000	15.7	-146	32
69	K <sub>0.9</sub> Ba <sub>0.1</sub> Ga <sub>1.1</sub> Ge <sub>2.9</sub> O <sub>8</sub> +0.1 wt% H <sub>3</sub> BO <sub>3</sub>	910	Monoclinic P2 <sub>1</sub> /a	5.6	10400	13		9
70	Li <sub>2</sub> MgSiO <sub>4</sub> +1 wt% LMZBS	925/2h	Orthorhombic	5.6	80000	8		19
71	K <sub>2</sub> Mo <sub>3</sub> O <sub>10</sub>	520	Monoclinic p-1	5.6	39300		-67	33
72	Zn <sub>1.8</sub> SiO <sub>3.8</sub> +20 mol% B <sub>2</sub> O <sub>3</sub>	900	Rhombohedral	5.7	53000		-16	34
73	Al <sub>2</sub> O <sub>3</sub> +50 vol% ZBS glass	900	Composite	5.7	17800	12.6		35
74	Mg <sub>5</sub> TaO <sub>3</sub> (BO <sub>3</sub> ) <sub>3</sub> +1 wt% LiF	1300/2h	Orthorhombic Pnma warwickite	5.7	27000			36
75	Al <sub>2</sub> W <sub>3-x</sub> Mo <sub>x</sub> O <sub>12</sub> (x=1)	810	Orthorhombic Pbcn	5.8	33810		-72	37
76	$\mu$ -cordierite+B <sub>2</sub> O <sub>3</sub> -P <sub>2</sub> O <sub>5</sub>	860	Composite	5.8	3000		-55	38
77	$\alpha$ -cordierite+B <sub>2</sub> O <sub>3</sub> -P <sub>2</sub> O <sub>5</sub>	950	Composite	5.8	6000		-15	38
78	Li <sub>2</sub> CaSiO <sub>4</sub> +1 wt% ZBS	975	Tetragonal I-42m	5.8	2000			14
79	K <sub>0.67</sub> Ba <sub>0.33</sub> Ga <sub>1.33</sub> Ge <sub>2.67</sub> O <sub>8</sub>	1020	Monoclinic C2/m	5.9	94100		-25	39
80	Al <sub>2</sub> O <sub>3</sub> +MgO-Al <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -GeO <sub>2</sub> + ZnO-B <sub>2</sub> O <sub>3</sub>	900	Composite	5.9	5590	8.4		40
81	Li <sub>2</sub> MgSiO <sub>4</sub> +2 wt% LMZBS glass	875/2h	Orthorhombic	5.9	111000	8		19
82	MgO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> +10 wt% TiO <sub>2</sub>	1050	Composite	5.9	16500			41
83	0.84SiO <sub>2</sub> - 0.16TiO <sub>2</sub>	1275/3h	Composite	5.9	36700	12.5	-5	42
84	Al <sub>2</sub> O <sub>3</sub> +50 vol% ZBS glass	800	Composite	6.0	14400	12.5		35
85	Zn <sub>2-x</sub> SiO <sub>4-x</sub> +25 mol% B <sub>2</sub> O <sub>3</sub>	900	Composite	6.0	70000		-22	43
86	CaO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub>	830	Glass	6.0	5000	10		44
87	Al <sub>2</sub> O <sub>3</sub> +50 vol% ZBS glass	850	Composite	6.0	16950	12.5		35
88	Al <sub>2</sub> O <sub>3</sub> +50 vol% ZBS glass	750	Composite	6.0	9200	12.4		35

89	$K_{0.67}Ba_{0.33}Ga_{1.33}Ge_{2.67}O_8$	970	Monoclinic P2 <sub>1</sub> /a	6.0	134000	13	-22	9
90	$K_xBa_{1-x}Ga_{2-x}Ge_{2+x}O_8$ (x=0.67)	910	Monoclinic C2/m	6.0	104500		-20	9
91	$Na_{0.8}Ca_{0.2}Al_{1.2}Si_{2.8}O_8$	1100	Triclinic P-1	6.0	17600		0	45
92	MgO-Al <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -TiO <sub>2</sub>		Composite	6.1	4200			46
93	$\alpha$ -Mg <sub>2</sub> P <sub>2</sub> O <sub>7</sub>	1150	Throtveitite type Monoclinic P2 <sub>1</sub> /c	6.1	38180		-746	47
94	CaWO <sub>4</sub> +0.5 wt% B <sub>2</sub> O <sub>3</sub>	1050	Sheelite Tetragonal I4 <sub>1</sub> /a	6.1	38100		-47	48,49
95	(Mg <sub>0.9</sub> Ni <sub>0.1</sub> ) <sub>2</sub> Al <sub>4</sub> Si <sub>5</sub> O <sub>18</sub>	1440/2h	Orthorhombic Cccm	6.1	99100		-32	50
96	MgO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>3</sub> glass ceramic		Glass	6.1	11300			51
97	$K_{0.6}Ba_{0.4}Ga_{1.4}Ge_{2.6}O_8$	970	Monoclinic P2 <sub>1</sub> /a	6.1	120900	13	-23	9
98	Mg <sub>2</sub> B <sub>2</sub> O <sub>5</sub>	1310	Monoclinic P2 <sub>1</sub> /c	6.2	32000		-45	52
99	KGaGe <sub>3</sub> O <sub>8</sub>	970	Monoclinic P2 <sub>1</sub> /a	6.2	19800		-21	39
100	Mg <sub>2</sub> Al <sub>4</sub> Si <sub>5</sub> O <sub>18</sub> cordierite	1440	Orthorhombic Cccm	6.2	40000		-25	38
101	50 wt% Al <sub>2</sub> O <sub>3</sub> +50 wt% (SiO <sub>2</sub> -B <sub>2</sub> O <sub>3</sub> -Al <sub>2</sub> O <sub>3</sub> )	875	Composite	6.2	11400	-	-35	27
102	45 wt% Al <sub>2</sub> O <sub>3</sub> +55 wt% (SiO <sub>2</sub> -B <sub>2</sub> O <sub>3</sub> -Al <sub>2</sub> O <sub>3</sub> )	875	Composite	6.3	11500	-	-33	27
103	AlSbO <sub>4</sub>	1100/3h	Tetragonal P4 <sub>2</sub> /mnm	6.3	3200	4	-	53
104	CaO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> +4 wt% La <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub>	850	Glass	6.3	10000			54
105	Al <sub>2</sub> W <sub>3-x</sub> Mo <sub>x</sub> O <sub>12</sub> (x=0)	1100	Orthorhombic Pbcn	6.3	9600		-67	37
106	Al <sub>2</sub> W <sub>3-x</sub> Mo <sub>x</sub> O <sub>12</sub> (x=2)	810	Orthorhombic Pbcn	6.3	36500		-55	37
107	0.9Mg <sub>2</sub> Al <sub>4</sub> Si <sub>5</sub> O <sub>18</sub> -0.1TiO <sub>2</sub>		Composite	6.3	55400	17.6	-21	55
108	42.5SiO <sub>2</sub> -21MgO-20Al <sub>2</sub> O <sub>3</sub> -16.5TiO <sub>2</sub>		Composite	6.3	27000	9.7	-6	56
109	Al <sub>2</sub> W <sub>3-x</sub> Mo <sub>x</sub> O <sub>12</sub> (x=3)	810	Monoclinic P2 <sub>1</sub> /a	6.4	49200		-41	37
110	55 wt% Al <sub>2</sub> O <sub>3</sub> +45 wt% (SiO <sub>2</sub> -B <sub>2</sub> O <sub>3</sub> -Al <sub>2</sub> O <sub>3</sub> )	900	Composite	6.4	13000	-	-58	27
111	Mg <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub>	950/5h	Orthorhombic Cmca	6.4	48800	-	-83	57
112	$K_{0.9}Ba_{0.1}Ga_{1.1}Ge_{2.9}O_8$	1040	Monoclinic C2/m	6.4	94700	12	-23	39
113	Y <sub>2</sub> BaCu <sub>0.75</sub> Ni <sub>0.25</sub> O <sub>5</sub>		Orthorhombic	6.4	8350	13.5	-40	58
114	$K_{0.4}Ba_{0.6}Ga_{1.6}Ge_{2.4}O_8$	1040	Monoclinic P2 <sub>1</sub> /a	6.4	94700	12	-23	39
115	BaAl <sub>2</sub> Si <sub>2</sub> O <sub>8</sub>	1475/3h	Hexagonal P6/mmm	6.4	44800		-47	59

(continued)

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116	Ca <sub>0.99</sub> Mg <sub>0.01</sub> SiO <sub>3</sub>	1290/2h	Wollastonite Monoclinic P2 <sub>1</sub> /a	6.5	62400		-43	60
117	Mg <sub>2</sub> GeO <sub>4</sub> +3 wt% B <sub>2</sub> O <sub>3</sub>	1200/4h	Orthorombic Pnma	6.5	91000		-28	61
118	ZnO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> glass (60.3:27.1:12.6)		Glass	6.5	4500	17.1	-10	35
119	0.3TeO <sub>2</sub> -SnTe <sub>3</sub> O <sub>8</sub>	660	Composite	6.5	8800		200	62
120	Li <sub>2</sub> CaSiO <sub>4</sub> +0.5 wt% BBS	925	Tetragonal I-42m	6.5	5500			14
121	Li <sub>2</sub> CaSiO <sub>4</sub> +0.5 wt% PBS	925	Tetragonal I-42m	6.5	1500			14
122	0.15ZnO-0.25Nd <sub>2</sub> O <sub>3</sub> -0.6B <sub>2</sub> O <sub>3</sub> + 50 wt% Al <sub>2</sub> O <sub>3</sub>	850	Composite	6.5	22500	18.9		63
123	Mg <sub>3</sub> B <sub>3</sub> O <sub>6</sub> +35 wt% LMBS	950	Composite	6.5	21000		-50	64
124	(Zn <sub>1-x</sub> Co <sub>x</sub> ) <sub>2</sub> SiO <sub>4</sub> (x=0.05)	900	Willimite Rhombic R3	6.5	5700		-55	65
125	(Zn <sub>0.095</sub> Co <sub>0.05</sub> ) <sub>2</sub> SiO <sub>4</sub> +2 wt% Li <sub>2</sub> O-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -CaO-Al <sub>2</sub> O <sub>3</sub>	900	Willimite	6.5	57000		-55	66
126	LiMgPO <sub>4</sub>	950	Orthorhombic Pmnb	6.6	79100		-60	67
127	(Mg <sub>0.4</sub> Zn <sub>0.6</sub> ) <sub>2</sub> SiO <sub>4</sub>		Trigonal R-3	6.6	95650		-60	68
128	Zn <sub>2</sub> SiO <sub>4</sub> +sol-gel	1325	Trigonal R-3	6.6	198400		-42	69
129	Sr <sub>2</sub> Al <sub>2</sub> Si <sub>0.9</sub> Ge <sub>0.1</sub> O <sub>7</sub>	1525	Tetragonal Gehhlenite type P-42 <sub>1</sub> m	6.6	22900		-28	70
130	Al <sub>2</sub> O <sub>3</sub> +50 vol % ZBS glass	700	Composite	6.6	2600	11.8		35
131	Ca <sub>1-x</sub> Sr <sub>x</sub> SiO <sub>3</sub> (x=0.8)		Monoclinic P2 <sub>1</sub> /a	6.6	66700		-40	71
132	MgO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> (42:45:13)		Glass	6.6	2100	6.88		72
133	Willemite (Zn <sub>2</sub> SiO <sub>4</sub> )	1340	Trigonal R-3	6.6	219000		-61	73
134	CaWO <sub>4</sub> +1 wt% MnSO <sub>4</sub>	1050	Scheelite I4 <sub>1</sub> /a	6.6	129540		-56	48,49
135	K <sub>0.9</sub> Ba <sub>0.1</sub> Ga <sub>1.1</sub> Ge <sub>2.9</sub> O <sub>8</sub>	990	Monoclinic C2/m	6.6	12700		-21	39
136	Zn <sub>1.8</sub> SiO <sub>3.8</sub>	1300/3h	WillemiteTrigonal R-3	6.6	147000		-22	74
137	MgO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> (42:45:13) glass		Glass	6.6	2130	6.9		75
138	ZnO-0.6 SiO <sub>2</sub> +Bi <sub>2</sub> O <sub>3</sub> -Li <sub>2</sub> CO <sub>3</sub>	910/2h	Glass	6.7	33000	11	-33	76
139	CaO-SiO <sub>2</sub>	1320	Glass ceramic	6.7	25400			77
140	50 wt% (La <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub> )+50 wt% Al <sub>2</sub> O <sub>3</sub>	850	Glass	6.7	2800	17.7		78
141	Mg <sub>1.975</sub> Mn <sub>0.025</sub> SiO <sub>4</sub> Fosterite	1400	Orthorhombic Pbnm	6.7	180000		-71	79

142	MgSiO <sub>3</sub>	1380/13h	Orthorhombic Pbnm	6.7	121200		-17	80
143	CaSiO <sub>3</sub> +1 wt% Al <sub>2</sub> O <sub>3</sub>	1250	Wollastonite Monoclinic P2 <sub>1</sub> /a	6.7	24600			81
144	LiMg <sub>0.9</sub> Zn <sub>0.1</sub> PO <sub>4</sub>	925	Orthorhombic Pmnb Olivine type	6.7	99700		-62	82
145	Zn <sub>3</sub> B <sub>2</sub> O <sub>6</sub>	925/4h	Triclinic I2/c	6.7	58500		-58	83
146	(Mg <sub>0.95</sub> La <sub>0.05</sub> ) <sub>2</sub> Al <sub>4</sub> Si <sub>5</sub> O <sub>18+0.05</sub>		Orthorhombic	6.7	78500	14.3	-22	84
147	Mg <sub>2</sub> SiO <sub>4</sub> +15 wt% LMZBS glass	950	Composite	6.8	30600			85
148	Mg <sub>2</sub> B <sub>2</sub> O <sub>5</sub> +55 wt% LMZBS glass	950	Composite	6.8	50000	7.28	-64	86
149	Mg <sub>2</sub> SiO <sub>4</sub> Fosterite	1450	Orthorhombic Pbnm	6.8	270000		-67	87
150	Li <sub>2</sub> ZnSiO <sub>4</sub> +20 wt% ZnO-B <sub>2</sub> O <sub>3</sub>	950/3h	Composite	6.8	9300		-51	88
151	Li <sub>2</sub> ZnSiO <sub>4</sub> +25 wt% ZnO-B <sub>2</sub> O <sub>3</sub>	950/3h	Composite	6.8	10800		-47	88
152	α-CaSiO <sub>3</sub>	1500	Monoclinic C2/c wollastonite	6.8	42200		-19	89
153	SrSiO <sub>3</sub>	1500	Monoclinic C2/c	6.8	13100		-66	89
154	Mg <sub>2</sub> GeO <sub>4</sub> +B <sub>2</sub> O <sub>3</sub>	1250	Orthorhombic Pnma	6.8	95000		-29	90
155	K <sub>2</sub> Mo <sub>4</sub> O <sub>13</sub>	540	Triclinic p-1	6.8	39800		-67	33
156	0.9Ca <sub>0.9</sub> Mg <sub>0.1</sub> SiO <sub>3</sub> -0.1CaMgSi <sub>2</sub> O <sub>6</sub>	1290/2h		6.9	118000			91
157	Mg <sub>1.93</sub> Ca <sub>0.07</sub> SiO <sub>4</sub> Fosterite	1400	Orthorhombic Pbnm	6.9	105000		-72	79
158	ZnO:B <sub>2</sub> O <sub>3</sub> (50:50) glass	<800	Glass	6.9	1733	16.4	-10	92
159	K <sub>0.67</sub> Ba <sub>0.33</sub> Ga <sub>1.33</sub> Ge <sub>2.67</sub> O <sub>8</sub>	1020	Monoclinic C2/m	6.9	32600	12	-27	39
160	ZnO:B <sub>2</sub> O <sub>3</sub> :SiO <sub>2</sub> (50:40:10) glass	611	Glass	6.9	1710	15.8	-21	92
161	BaGa <sub>2</sub> Ge <sub>2</sub> O <sub>8</sub>	1100/12h	Monoclinic P2 <sub>1</sub> /a	6.9	10640		-26	39
162	xMgO-(1-x)B <sub>2</sub> O <sub>3</sub> (x=0.75)	1350/4h	Orthorhombic Pnmn	6.9	119600		-69	93
163	MgO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> +10 wt% TiO <sub>2</sub>		Composite	6.9	16500			51
164	3ZnO-B <sub>2</sub> O <sub>3</sub>	950/1h	Glass	6.9	20600	6.35	-80	94
165	(Ca <sub>0.9</sub> Mg <sub>0.1</sub> )SiO <sub>3</sub> +Li <sub>2</sub> CO <sub>3</sub> -Bi <sub>2</sub> O <sub>3</sub>	890/2h	Mixed phases	6.9	27000		-40	95
166	16ZnO-16La <sub>2</sub> O <sub>3</sub> -68B <sub>2</sub> O <sub>3</sub> +50 wt% Al <sub>2</sub> O <sub>3</sub>	950	Composite	6.9	12100	18.1	-12	96
167	Sm <sub>2</sub> Si <sub>2</sub> O <sub>7</sub> +15 wt% LMZBS	950/2h	Tetragonal P4 <sub>1</sub>	6.9	5000	10		97
168	Zn <sub>2</sub> GeO <sub>4</sub>	1300	Trigonal R-3	6.9	102700		-32	98
169	LiMg <sub>0.95</sub> Ni <sub>0.05</sub> PO <sub>4</sub>	875	Orthorhombic olivine type	6.9	98600		-55	99

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
170	(Mg <sub>0.95</sub> Ni <sub>0.05</sub> ) <sub>2</sub> SiO <sub>4</sub> +12 wt% Li <sub>2</sub> CO <sub>3</sub> -V <sub>2</sub> O <sub>5</sub>	1150/4h	Orthorhombic	6.9	99800		-50	100
171	HfSiO <sub>4</sub>		Tetragonal amd	7.0	25000	10	-44	101
172	Sr <sub>0.05</sub> Ba <sub>0.95</sub> Al <sub>2</sub> Si <sub>2</sub> O <sub>8</sub>	1600/162h	Monoclinic celsian I2/c	7.0	92600		-22	102
173	Mg <sub>3</sub> B <sub>2</sub> O <sub>6</sub> +5 wt% Mg <sub>2</sub> B <sub>2</sub> O <sub>5</sub>	1310/20h	Kotoite Orthorhombic Pnmm	7.0	241000		-18	52,103
174	SrCuP <sub>2</sub> O <sub>7</sub>	925	Monoclinic P2 <sub>1</sub> /n	7.0	101110		-62	104
175	CaMgSi <sub>2</sub> O <sub>6</sub>	900/1h	Monoclinic C2/c	7.0	43200		-22	105
176	CaMgSi <sub>2</sub> O <sub>6</sub> +8.5 wt% ZrO <sub>2</sub>	950	Composite	7.0	7300			106
177	Mg <sub>2</sub> SiO <sub>4</sub> +1 wt% TiO <sub>2</sub> Fosterite	1300	Orthorhombic Pbnm	7.0	230000		-65	107
178	Ba <sub>2</sub> V <sub>2</sub> O <sub>7</sub>	950	Anorthic Triclinic P-1	7.0	19000		-74	108
179	$\delta$ -Ba <sub>2</sub> P <sub>2</sub> O <sub>7</sub>	1150	Dichromatic type Hexagonal P-62m	7.0	12300			47
180	Ba <sub>2</sub> MgSi <sub>2</sub> O <sub>7</sub>	1350/10h	Tetragonal P-421m	7.0	31000		-60	109
181	Sr <sub>2</sub> Al <sub>2</sub> SiO <sub>7</sub>	1525	Tetragonal P4-2 <sub>1</sub> m	7.0	33000		-34	110
182	LiMg <sub>0.95</sub> Co <sub>0.05</sub> PO <sub>4</sub>	875/2h	Orthorhombic olivine type	7.0	111200		-54	111
183	SrZnP <sub>2</sub> O <sub>7</sub>	950	Monoclinic P2 <sub>1</sub> /n	7.1	52780		-70	104,112
184	MgMoO <sub>4</sub>	900	Wolframite Monoclinic C2/m	7.1	79100		-46	113
185	ZnO:B <sub>2</sub> O <sub>3</sub> :SiO <sub>2</sub> (50:30:20) glass	614Td	Glass	7.1	1670	15.9	-43	92
186	$\alpha$ -Sr <sub>2</sub> P <sub>2</sub> O <sub>7</sub>	1150	Dichromatic type Orthorhombic Pnam	7.1	33500		-23	47
187	SrO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> (32.85:52.09:15.05) glass		Glass	7.1	3600	6.7		72
188	MgTiO <sub>3</sub> +15 wt% CaTiO <sub>3</sub> +ZnO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> (35:25:40)	900/0.5h	Composite	7.1	3500	16	6	114
189	0.95Zn <sub>2</sub> SiO <sub>4</sub> -0.05CaTiO <sub>3</sub> +Li <sub>2</sub> CO <sub>3</sub> - H <sub>3</sub> BO <sub>3</sub>	950	Trigonal R-3	7.1	26300		-5	115
190	Li <sub>2</sub> CaSiO <sub>4</sub> +3 wt% ZBS	875	Tetragonal I-42m	7.1	2000			14
191	0.88(Mg <sub>0.4</sub> Zn <sub>0.6</sub> ) <sub>2</sub> SiO <sub>4</sub> -0.12CaTiO <sub>3</sub> +4 wt% Li <sub>2</sub> CO <sub>3</sub> -H <sub>3</sub> BO <sub>3</sub>	950	Composite	7.1	28600		-6	116
192	Mg <sub>3</sub> B <sub>2</sub> O <sub>6</sub>		Kotoite Orthorhombic Pnmm	7.2	150400	16		117

193	BaAl <sub>2</sub> Si <sub>2</sub> O <sub>8</sub>	1500/12h	Monoclinic	7.2	70600	10.5	-22	118
194	Sr <sub>0.05</sub> Ba <sub>0.95</sub> Al <sub>2</sub> Si <sub>2</sub> O <sub>8</sub>	1500/40h	Monocelsian Hexagonal P6/mmm	7.2	77000	10.5		118
195	Li <sub>2</sub> CaSiO <sub>4</sub> +1 wt% LBS	925	Tetragonal I-42m	7.2	4000			14
196	Sr <sub>2</sub> Al <sub>2</sub> SiO <sub>7</sub>	1525	Gehlenite Tetragonal P-42 <sub>1</sub> m	7.2	33000		-37	119
197	CaO-MgO-SiO <sub>2</sub> +10 wt% Li <sub>2</sub> O-Bi <sub>2</sub> O <sub>3</sub> (Sol gel)	890	Composite	7.2	25600		-69	120
198	Sr <sub>2</sub> Al <sub>1.9</sub> Ga <sub>0.1</sub> SiO <sub>7</sub>	1525	Tetragonal P-42 <sub>1</sub> m	7.2	21500		-41	70
199	Mg <sub>2</sub> SiO <sub>4</sub> +0.5 wt% LMZBS glass Fosterite	1525	Orthorhombic Pbnm	7.3	121200			85
200	Li <sub>2</sub> CaSiO <sub>4</sub> +3 wt% BZBS	900	Tetragonal I-42m	7.3	1700			14
201	Sr <sub>2</sub> Al <sub>2</sub> SiO <sub>7</sub> +0.5 wt% LMZBS glass	1500	Gehlenite P4-2 <sub>1</sub> m, Tetragonal	7.3	34200		-36	70
202	Sr <sub>2</sub> Al <sub>2</sub> SiO <sub>7</sub> +1 wt% LMZBS glass	1500	Gehlenite P4-2 <sub>1</sub> m, Tetragonal	7.3	36300		-23	70
203	Sr <sub>2-x</sub> Ca <sub>x</sub> Al <sub>2</sub> SiO <sub>7</sub> (x=0.25)	1450	Tetragonal P4-2 <sub>1</sub> m	7.3	26000		-34	110
204	SrZnP <sub>2</sub> O <sub>7</sub>	925/2h	Monoclinic P2 <sub>1</sub> /n	7.3	71520		-64	104
205	BaO:B <sub>2</sub> O <sub>3</sub> :SiO <sub>2</sub> (30:20:50) glass	717 Td	Glass	7.3	1840	14.8	-62	92
206	BaCu(B <sub>2</sub> O <sub>5</sub> )	810		7.3	50000		-32	121
207	CaO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> (69.7:16.2:14.1 mol%)	900	Glass	7.3	2300	9.6		8
208	CaO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> (38.3:31.5:30.2 mol%)	900	Glass	7.3	1800	9.6		8
209	BaO:B <sub>2</sub> O <sub>3</sub> :SiO <sub>2</sub> (30:40:30) glass	677 Td	Glass	7.3	2700	15.4	-34	92
210	BaO:B <sub>2</sub> O <sub>3</sub> :SiO <sub>2</sub> (30:60:10) glass	627 Td	Glass	7.3	3390	14.9	-25	92
211	CaCuP <sub>2</sub> O <sub>7</sub>	900/2h	Monoclinic P2 <sub>1</sub> /n	7.3	71620		-76	104
212	Mn <sub>2</sub> P <sub>2</sub> O <sub>7</sub>	1150	Monoclinic C2/m	7.3	23850		-96	47
213	Zn <sub>1.8</sub> SiO <sub>3.8</sub> +12 wt% V <sub>2</sub> O <sub>5</sub>	875/2h	Trigonal R-3	7.3	17500		-28	122
214	Y <sub>2</sub> BaCu <sub>0.6</sub> Mg <sub>0.4</sub> O <sub>5</sub>		Orthorhombic Pmmm	7.4	25320	12.9	-56	58,123
215	CaAl <sub>2</sub> Si <sub>2</sub> O <sub>8</sub> (Anorthite)	1500	Triclinic P-1	7.4	12000		-130	29
216	MgAl <sub>2</sub> O <sub>4</sub> +Li-Mg-Zn-B-Si-O glass	1000	Glass-ceramic	7.4	48000	24	-90	124
217	Mg <sub>2</sub> Si <sub>0.9</sub> Ti <sub>0.1</sub> O <sub>4</sub> Fosterite	1425	Orthorhombic Pbnm	7.4	73760	15	-60	125
218	ZrSiO <sub>4</sub>	1550	Tetragonal I4 <sub>1</sub>	7.4	8500	5.15	-50	126
219	19ZnO-13La <sub>2</sub> O <sub>3</sub> -68B <sub>2</sub> O <sub>3</sub> +40 wt% Al <sub>2</sub> O <sub>3</sub>		Composite	7.4	18100			127
220	xMgO-(1-x)B <sub>2</sub> O <sub>3</sub> (x=0.8)	1350/4h	Composite	7.4	247880		-65	93

(continued)



No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
221	CaMgSi <sub>2</sub> O <sub>6</sub>	1300/3h	Monoclinic C2/c	7.4	59700		-42	128
222	Sr <sub>2-x</sub> Ca <sub>x</sub> Al <sub>2</sub> SiO <sub>7</sub> (x=0.5)	1450	Tetragonal P4-2 <sub>1</sub> m	7.4	25000		-33	110
223	Alpha CaSiO <sub>3</sub> +6 wt% SiO <sub>2</sub>	1350		7.4	33700		-11	129
224	Mg <sub>2.15</sub> SnO <sub>4</sub>	1620/4h	Spinel Cubic Fd3m	7.4	76800		-50	130
225	BaCu (B <sub>2</sub> O <sub>5</sub> )	850		7.4	23000		-75	131
226	LiZnVO <sub>4</sub> (Using V <sub>2</sub> O <sub>5</sub> )	800	Trigonal phenakite R-3	7.5	25400		-123	132
227	CaO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> (42:45:13)		Composite	7.5	2400	6.24		72
228	20ZnO-16La <sub>2</sub> O <sub>3</sub> -64B <sub>2</sub> O <sub>3</sub> +50 wt% Al <sub>2</sub> O <sub>3</sub>	950	Composite	7.5	13500		-10	96
229	BaAl <sub>2</sub> Ge <sub>2</sub> O <sub>8</sub>	1350/12h	Monoclinic I2/c	7.5	74100		-32	102
230	SrSiO <sub>3</sub> -NiO	1375	Monoclinic C2	7.5	56500		64	133
231	HfSiO <sub>4</sub> +2 wt% LMZBS	1400/4h	Tetragonal I4 <sub>1</sub> /amd	7.5	7500	5		134
232	CaO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> (42:45:13) glass		Glass	7.5	2380	6.2		72
233	DyBO <sub>3</sub> ,HoBO <sub>3</sub> ,YBO <sub>3</sub>		Vaterite Hexagonal P6 <sub>3</sub> /mmc	7.5	10000			135
234	$\alpha$ -Zn <sub>2</sub> P <sub>2</sub> O <sub>7</sub>	1150	Throtveitit Monoclinic C2/m	7.5	50000		-204	47
235	Mg <sub>2.05</sub> SiO <sub>4</sub> Fosterite	1550/3h	Orthorhombic Pbnm	7.5	114700	10.6	-59	75
236	Ba <sub>2</sub> ZnSi <sub>2</sub> O <sub>7</sub>	1350	Monoclinic	7.5	48000		-74	109
237	K <sub>2</sub> Mo <sub>2</sub> O <sub>7</sub>	460	Triclinic	7.5	22300		-63	33
238	ZnO:B <sub>2</sub> O <sub>3</sub> :SiO <sub>2</sub> (60:20:20) glass	<800	Glass	7.5	1410	15.4	-84	92
239	ZnO:B <sub>2</sub> O <sub>3</sub> (60:40) glass	<800	Glass	7.5	1430	15.1	-3	92
240	LiZnVO <sub>4</sub> (Using NH <sub>3</sub> VO <sub>3</sub> )	720	Trigonal phenakite R-3	7.5	27600		-114	132
241	ZnO:B <sub>2</sub> O <sub>3</sub> :SiO <sub>2</sub> (60:30:10) glass	<800	Glass	7.6	1440	15.5	-21	92
242	CaZnP <sub>2</sub> O <sub>7</sub>	900/2h	Pyrophosphate	7.6	63130		-82	136
243	20CaO-20La <sub>2</sub> O <sub>3</sub> -60B <sub>2</sub> O <sub>3</sub> +40 wt% Al <sub>2</sub> O <sub>3</sub>	850	Composite	7.6	5000	17.4		137
244	BaO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> (42:45:13) glass		Glass	7.6	4100	6.65		72
245	BaGa <sub>2</sub> Si <sub>2</sub> O <sub>8</sub>	1350/12h	Monoclinic I2/c	7.6	62300		-32	102
246	24ZnO-16La <sub>2</sub> O <sub>3</sub> -60B <sub>2</sub> O <sub>3</sub> +50 wt% Al <sub>2</sub> O <sub>3</sub>	950	Glass	7.6	17600	16.9	-14	96
247	CaMgSi <sub>2</sub> O <sub>6</sub>	1300 CIP	Monoclinic C12/c1	7.6	121380		-66	138

248	Zn <sub>2</sub> SiO <sub>4</sub> +8 mol% Bi <sub>2</sub> O <sub>3</sub>	885/2h	Trigonal R-3	7.6	12600		-22	139
249	BaO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> (42:45:13)		Glass	7.6	4000	6.65		72
250	LiZnVO <sub>4</sub>	750/2h	Rhombohedral R3	7.6	22000		-110	140
251	xMgO-(1-x)B <sub>2</sub> O <sub>3</sub> (x=0.9)	1350/4h	Orthorhombic Pnmm	7.7	376800		-58	93
252	Y <sub>2</sub> BaCu <sub>0.9</sub> Mg <sub>0.1</sub> O <sub>5</sub> ClP	1250	Orthorhombic Pbnm	7.7	37500	14.5	-37	123
253	CaMg <sub>0.9</sub> Zn <sub>0.1</sub> Si <sub>2</sub> O <sub>6</sub> +0.6 wt% LiF	900	Monoclinic C12/c1	7.7	70000		-25	141
254	0.91Mg <sub>2</sub> SiO <sub>4</sub> -0.09CaTiO <sub>3</sub> +12 wt% Bi <sub>2</sub> O <sub>3</sub> -Li <sub>2</sub> CO <sub>3</sub> -H <sub>3</sub> BO <sub>3</sub>	950	Fosterite composite	7.7	11300	6.1	-5	142
255	Li <sub>2</sub> Mg <sub>2</sub> (WO <sub>4</sub> ) <sub>3</sub>	875	Orthorhombic Pnma	7.7	29600	6	-16	143
256	α-Ca <sub>2</sub> P <sub>2</sub> O <sub>7</sub>	1290/4h	Monoclinic P2 <sub>1</sub> /n	7.8	14100		-97	144
257	Li <sub>2</sub> CaSiO <sub>4</sub> +3 wt% PBS	900	Tetragonal I-42m	7.8	2700			14
258	Mg <sub>3</sub> Sm <sub>4</sub> Al <sub>44</sub> O <sub>75</sub> +B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -Al <sub>2</sub> O <sub>3</sub>	920	Magnetoplumbite	7.8	10000		11	145
259	DyPO <sub>4</sub>	1600	Xenotime tetragonal I4 <sub>1</sub> /amd	7.8	28700		-17	146
260	TbPO <sub>4</sub>	1600	Xenotime tetragonal I4 <sub>1</sub> /amd	7.8	20100		-18	146
261	27ZnO-16La <sub>2</sub> O <sub>3</sub> -57B <sub>2</sub> O <sub>3</sub> +50 wt% Al <sub>2</sub> O <sub>3</sub>	950	Composite	7.8	22700	16.8	-19	96
262	45CaO-31.7B <sub>2</sub> O <sub>3</sub> -23.3SiO <sub>2</sub>	715	Composite	7.8	1130	12.5		6
263	27ZnO-16La <sub>2</sub> O <sub>3</sub> -57B <sub>2</sub> O <sub>3</sub> glass+50 wt% Al <sub>2</sub> O <sub>3</sub>		Composite	7.8	1350	16.8		96
264	xMgO-(1-x)B <sub>2</sub> O <sub>3</sub> (x=0.85)	1350/4h	Composite	7.8	307600		-58	93
265	Li <sub>x</sub> Zn <sub>2-x</sub> V <sub>x</sub> Si <sub>1-x</sub> O <sub>4</sub> (x=0.8)	820		7.8	21100	11.5		147
266	CaMg <sub>0.9</sub> Zn <sub>0.1</sub> Si <sub>2</sub> O <sub>6</sub> +5 wt% MgF <sub>2</sub>	1050		7.8	169800	11.7	-26	148
267	Yb <sub>2</sub> BaCuO <sub>5</sub>		Orthorhombic Pnma	7.9	7290		-44	149
268	LiMgPO <sub>4</sub> +0.05 wt% TiO <sub>2</sub>	950	Orthorhombic Pmnb	7.9	63600		-36	67
269	SrWO <sub>4</sub>	1150	Tetragonal I4 <sub>1</sub> /a	7.9	56000		-55	150
270	Mg <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub>	950/10h	Orthorhombic Cmca	7.9	53000		-84	57
271	CaO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> (50.1:22.2:67.3 mol%)	900	Composite	7.9	2100	9.6		8
272	CaMg <sub>0.9</sub> Zn <sub>0.1</sub> Si <sub>2</sub> O <sub>6</sub>	1200	Monoclinic C2/c	7.9	76100		-22	141
273	ZnAl <sub>2</sub> O <sub>4</sub>	1700	Spinel cubic Fd3m	7.9	82000		-63	151
274	Sr <sub>2</sub> ZnSi <sub>2</sub> O <sub>7</sub> +15 wt% LMZBS	875	Composite	7.9	39000	12.71	-54	152
275	MgO	1490	Cubic Fm3m	7.9	113600	16.4		153

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
276	Nd <sub>2</sub> SiO <sub>5</sub>	1500	Monoclinic P2 <sub>1</sub> /c	7.9	38800	18.35	-53	154
277	Ca(Sn <sub>0.1</sub> Si <sub>0.9</sub> )O <sub>3</sub>	1375	Monoclinic P2 <sub>1</sub> /a	7.9	58000		-43	155
278	$\alpha$ -CaSiO <sub>3</sub> +2 wt% TiO <sub>2</sub>	1300	Mixture	7.9	16500		1	156
279	Ca(Mg <sub>1-x</sub> Al <sub>x</sub> )(Si <sub>1-x/2</sub> Al <sub>x/2</sub> ) <sub>2</sub> O <sub>6</sub> (x=0.08)	1275	Monoclinic C2/c	7.9	59800		-42	157
280	NaAgMoO <sub>4</sub>	400	Spinel Fd-3m	7.9	33000		-120	158
281	Mg <sub>2</sub> SnO <sub>4</sub> +LiF-Fe <sub>2</sub> O <sub>3</sub> -V <sub>2</sub> O <sub>5</sub>	1050	Cubic Fd3m	7.9	41400		-82	159
282	$\alpha$ -CaSiO <sub>3</sub> +2 wt% Al <sub>2</sub> O <sub>3</sub> +2.5 wt% TiO <sub>2</sub>	1250	Composite	7.9	24000		-1	160
283	5ZnO-2B <sub>2</sub> O <sub>3</sub> +6 mol% Pb <sub>1.5</sub> Nb <sub>2</sub> O <sub>6.5</sub>	910	Composite	7.9	15000	7.4	-7	161
284	CAS-T5 glass (CaO:Al <sub>2</sub> O <sub>3</sub> :SiO <sub>2</sub> :TiO <sub>2</sub> :B <sub>2</sub> O <sub>3</sub> )	950	Composite	8.0	22500	10	-20	163
285	CaMgSi <sub>2</sub> O <sub>6</sub> +15 wt% LBS glass	925/2h	Monoclinic C2/c	8.0	15000	10.17	-49	164
286	Ca <sub>1-x</sub> Cd <sub>x</sub> MoO <sub>4</sub> (x=0)	1075	Sheelite fergusonite type Tetragonal I4 <sub>1</sub> /a	8.0	46500		-20	165
287	CaAl <sub>2</sub> Si <sub>2</sub> O <sub>8</sub> +5 wt% TiO <sub>2</sub>	900	Anorthic I-1	8.0	22500		-50	163
288	CaMgSi <sub>2</sub> O <sub>6</sub> +12 wt% Al <sub>2</sub> O <sub>3</sub>	1250	Composite	8.0	60100		-48	166
289	Li <sub>2</sub> O-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -Al <sub>2</sub> O <sub>3</sub> -CaO	550	Composite	8.0	2400		-48	167,168
290	La <sub>2</sub> O <sub>3</sub> -2B <sub>2</sub> O <sub>3</sub> -0.5ZnO	900	Composite	8.0	72000	13		169
291	YPO <sub>4</sub>	1600	Xenotime tetragonal I4 <sub>1</sub> /amd	8.0	67900		-35	146
292	Sr <sub>2-x</sub> Ca <sub>x</sub> Al <sub>2</sub> SiO <sub>7</sub> (x=1)	1475	Tetragonal P4-2 <sub>1</sub> m	8.0	27500		-42	110
293	0.94Mg <sub>2</sub> SiO <sub>4</sub> -0.06Ca <sub>0.9</sub> Sr <sub>0.1</sub> TiO <sub>3</sub>	1440/3h	Composite	8.0	53400	14.4	-4	170
294	20MgO-20La <sub>2</sub> O <sub>3</sub> -60B <sub>2</sub> O <sub>3</sub> +40 wt% Al <sub>2</sub> O <sub>3</sub>	950	Composite	8.1	19000			137
295	BaWO <sub>4</sub>	1150	Scheelite Tetragonal I4 <sub>1</sub> /a	8.1	56000		-55	150,171
296	SrWO <sub>4</sub>	1150	Tetragonal I4 <sub>1</sub> /a	8.1	57500		-78	150
297	MgZn <sub>2</sub> (VO <sub>4</sub> ) <sub>2</sub>	800/5h	Orthorhombic Cmca	8.1	44700		-108	172
298	Li <sub>2</sub> CaSiO <sub>4</sub> +3 wt% BBS	900	Tetragonal I-42m	8.1	2000			14
299	60 wt% La <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub> +40 wt% Al <sub>2</sub> O <sub>3</sub>	850	Composite	8.1	4500	17.5		78
300	CaZrB <sub>2</sub> O <sub>6</sub>	1075	Dolomite type borate	8.1	39400		3	173
301	Mg <sub>0.8</sub> Zn <sub>0.2</sub> Al <sub>2</sub> O <sub>4</sub>		Spinel Cubic Fd3m	8.1	87000			174

302	20MgO-20La <sub>2</sub> O <sub>3</sub> -60B <sub>2</sub> O <sub>3</sub> +40 wt% Al <sub>2</sub> O <sub>3</sub>	950	Composite	8.1	19000	16.1		137
303	(Mg <sub>0.95</sub> Zn <sub>0.05</sub> )Al <sub>2</sub> O <sub>4</sub>	1580	Spinel cubic Fd3m	8.1	165000		-68	175
304	Ag <sub>2</sub> MoO <sub>4</sub>	450 2h	Cubic Fd3-m	8.1	17000		-133	176
305	MgTiO <sub>3</sub> -CaTiO <sub>3</sub> (MMT-20)+ SiO <sub>2</sub> -B <sub>2</sub> O <sub>3</sub> -BaO	875	Composite	8.2	3000	7		177
306	BaWO <sub>4</sub> +0.5 wt% B <sub>2</sub> O <sub>3</sub>	950	Scheelite Tetragonal I4 <sub>1</sub> /a	8.2	32700		-18	48,49
307	20ZnO-20La <sub>2</sub> O <sub>3</sub> -60B <sub>2</sub> O <sub>3</sub> +40 wt% Al <sub>2</sub> O <sub>3</sub>	950	Composite	8.2	20000	17.1		137
308	CaMgSi <sub>2</sub> O <sub>6</sub> +15 wt% LMZBS glass	900/2h	Monoclinic C2/c	8.2	32000	10.15	-48	164
309	Mg <sub>0.6</sub> Zn <sub>0.4</sub> Al <sub>2</sub> O <sub>4</sub>		Spinel Cubic Fd3m	8.2	93000			174
310	LiMg <sub>0.9</sub> Zn <sub>0.1</sub> PO <sub>4</sub> +0.05 Vt TiO <sub>2</sub>	925	Orthorhombic Pmnb Olivine type	8.2	80200		-39	82
311	Nd <sub>2</sub> Mo <sub>3</sub> O <sub>12</sub>	945	Monoclinic C2/c	8.2	80000		-60	178
312	Mg <sub>2</sub> V <sub>2</sub> O <sub>7</sub> +6 mol %Li <sub>2</sub> CO <sub>3</sub>	800	Monoclinic P2 <sub>1</sub> /c	8.2	70600		-35	179
313	LiInSiO <sub>4</sub>	1150	Orthorhombic Pnma	8.2	12600		-55	180
314	Zn <sub>2</sub> (Sn <sub>1-x</sub> Si <sub>x</sub> )O <sub>4</sub> (x=0.07)	1175/4h		8.2	55500		-120	181
315	BaMgV <sub>2</sub> O <sub>7</sub>	830	Orthorhombic	8.2	37600	11.7	-35	182
316	YbPO <sub>4</sub>	1600	Xenotime tetragonal I4 <sub>1</sub> /amd	8.2	71600		-28	146
317	70 wt% La <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub> +30 wt% Al <sub>2</sub> O <sub>3</sub>	850	Composite	8.3	5500	17.2		78
318	Li <sub>2</sub> CaSiO <sub>4</sub> +1 wt% BBS	925	Tetragonal I-42m	8.3	10000			14
319	Y <sub>2</sub> BaCuO <sub>5</sub> (CIP)		Orthorhombic Pbnm	8.3	53300		-40	123
320	20ZnO-20La <sub>2</sub> O <sub>3</sub> -60B <sub>2</sub> O <sub>3</sub> +40 wt% Al <sub>2</sub> O <sub>3</sub>	950	Composite	8.3	18600	17		137
321	Mg <sub>0.75</sub> Ni <sub>0.25</sub> Al <sub>2</sub> O <sub>4</sub>		Spinel cubic Fd3m	8.3	130000	15.4	-53	183
322	CaMgSi <sub>2</sub> O <sub>6</sub>	1300/2h	Monoclinic C2/c	8.3	53000	10.27	-45	164
323	Mg <sub>0.4</sub> Zn <sub>0.6</sub> Al <sub>2</sub> O <sub>4</sub>		Spinel cubic Fd3m	8.3	93000			174
324	Sr <sub>2</sub> MgSi <sub>2</sub> O <sub>7</sub>	1550	Akermite Tetragonal P4-2 <sub>1</sub> m	8.3	55000		-48	133
325	20ZnO-20La <sub>2</sub> O <sub>3</sub> -60B <sub>2</sub> O <sub>3</sub> +40 wt% Al <sub>2</sub> O <sub>3</sub>	850	Composite	8.3	1100	17.1		137
326	LiInSiO <sub>4</sub> +1 wt% LMZBS	1100	Orthorhombic Pnma	8.4	22000		-45	180

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
327	Ca <sub>3</sub> SnSi <sub>2</sub> O <sub>9</sub>	1525	Cuspidine P2 <sub>1</sub> /c	8.4	92000		-60	184
328	Mg <sub>0.2</sub> Zn <sub>0.8</sub> Al <sub>2</sub> O <sub>4</sub>		Spinel cubic Fd3m	8.4	98000			174
329	Sm <sub>2</sub> SiO <sub>5</sub>	1500	Monoclinic P2 <sub>1</sub> /c	8.4	64000		-37	185
330	Mg <sub>2</sub> SnO <sub>4</sub>	1550/4h	Cubic spinel Fd3m	8.4	55100		-62	186
331	MgAl <sub>2</sub> O <sub>4</sub> (SPS)	1325	Spinel cubic Fd3m	8.4	54000		-74	187
332	(1-x)Ba <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub> -xMg <sub>2</sub> SiO <sub>4</sub> (x=0.65)	1200	Composite	8.4	52200		-7	188
333	80 wt% La <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub> +20 wt% Al <sub>2</sub> O <sub>3</sub>	850	Composite	8.4	9800	17.6		78
334	CaSiO <sub>3</sub>	1300	Wollastonite Monoclinic P2 <sub>1</sub> /a	8.4	16000	10		189
335	Ca <sub>3</sub> SnSi <sub>2</sub> O <sub>9</sub>	1400	Monoclinic P2 <sub>1</sub> /c	8.4	93300		-70	189
336	Sr <sub>2</sub> ZnSi <sub>2</sub> O <sub>7</sub>	1475	Akermite Tetragonal P4-2 <sub>1</sub> m	8.4	105000		-52	133
337	$\beta$ -Ca <sub>2</sub> P <sub>2</sub> O <sub>7</sub>	1150/2h	Tetragonal P4 <sub>1</sub> dichromatic type	8.4	53500		-53	104
338	Ca <sub>2</sub> Al <sub>2</sub> SiO <sub>7</sub>	1500	Tetragonal P4-2 <sub>1</sub> m	8.4	33000		-34	110
339	0.86(Mg <sub>0.4</sub> Zn <sub>0.6</sub> ) <sub>2</sub> SiO <sub>4</sub> -0.14CaTiO <sub>3</sub>	1180/4h	Composite	8.4	28100		-6	190
340	Li <sub>2</sub> Mg <sub>2</sub> W <sub>3</sub> O <sub>12</sub>	720	Lyonsite-type orthorhombic	8.4	56700		-73	191
341	BaZnP <sub>2</sub> O <sub>7</sub>	875/2h	Triclinic P-1	8.4	27900	11.1	-57	192
342	Li <sub>2</sub> Mg <sub>2</sub> W <sub>3</sub> O <sub>12</sub>	720	Orthorhombic lyonsite	8.4	56700		-73	193
343	Yb <sub>2</sub> Ba(Cu <sub>0.5</sub> Ni <sub>0.5</sub> )O <sub>5</sub>			8.5	13300		-46	194
344	TbPO <sub>4</sub>	1650/2h	Tetragonal I4 <sub>1</sub> /amd	8.5	20100		-17	146
345	MgAl <sub>2</sub> O <sub>4</sub>	1650/3h	Spinel Cubic Fd3m	8.5	105000		-63	195
346	Li <sub>2</sub> MgSiO <sub>4</sub>		Orthorhombic	8.5	30000	15		117
347	Li <sub>2</sub> O-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> frit glass	<800	Glass	8.5	1800		-157	196
348	MgTiO <sub>3</sub> -CaTiO <sub>3</sub> (MMT)-20-ZnO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> (44.57:17.32:6.95:30.16)	875	Composite	8.5	7000	7	6	177,197
349	ZnAl <sub>2</sub> O <sub>4</sub>	1375	Spinel Cubic Fd3m	8.5	56000	12.3	-79	198
350	ZnO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -MMT-20 (44.57:17.32:6.95:30.16)	875	Composite	8.5	3000	7	6	197
351	Mg <sub>4</sub> Nb <sub>2</sub> O <sub>9</sub> (Precipitation)	950	Corundum type P-3c1	8.5	50000			199
352	CaMgSi <sub>2</sub> O <sub>6</sub> +1 wt% LBS glass	1300/2h	Monoclinic C2/c	8.5	64000	10.27	-45	164
353	0.84Al <sub>2</sub> O <sub>3</sub> -0.16TiO <sub>2</sub> +8 wt% MCAS glass	1250	Composite	8.5	9900		-2	200
354	MnMoO <sub>4</sub>	900	Wolframite Monoclinic C2/m	8.5	54100		-74	113

355	Mn <sub>2</sub> SiO <sub>4</sub>	1100/N <sub>2</sub>	Orthorhombic Pbnm	8.5	50000	−90	79,201
356	Ca <sub>0.8</sub> Sr <sub>0.2</sub> SnO <sub>3</sub>	1540	Perovskite Orthorhombic Pbnm	8.5	6700	−44	202
357	13CaO-19La <sub>2</sub> O <sub>3</sub> -68B <sub>2</sub> O <sub>3</sub> +40 wt% Al <sub>2</sub> O <sub>3</sub>		Composite	8.5	8100		127
358	(Zn <sub>0.8</sub> Mg <sub>0.2</sub> ) <sub>2</sub> SiO <sub>4</sub> -TiO <sub>2</sub> +3 wt% Li <sub>2</sub> O-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> glass	870/2h	Composite	8.5	11500	0	203
359	(Mg <sub>0.93</sub> Zn <sub>0.07</sub> ) <sub>2</sub> SnO <sub>4</sub>	1550/4h	Cubic spinel Fd3m	8.5	186100	−61	204
360	Mg <sub>0.8</sub> Co <sub>0.2</sub> Al <sub>2</sub> O <sub>4</sub>	1475	Spinel cubic Fd3m	8.5	50000	−60	205
361	CaW <sub>1-x</sub> Te <sub>x</sub> O <sub>4</sub> (x=0.15)	900	Scheelite I4 <sub>1</sub> /a	8.5	44000		206
362	Sr <sub>2</sub> ZnSi <sub>2</sub> O <sub>7</sub>	1475	P-42 <sub>1</sub> /m Hardystonite	8.5	105000	−52	133,152
363	Li <sub>2</sub> Ca <sub>2</sub> Mo <sub>3</sub> O <sub>12</sub>	630	Lyonsite orthorhombic	8.5	108000	13.2 −89	207
364	Y <sub>2</sub> BaCu <sub>0.25</sub> Ni <sub>0.75</sub> O <sub>5</sub>		Orthorhombic Immm	8.6	31290	12.5 −36	58
365	0.88Al <sub>2</sub> O <sub>3</sub> -0.12TiO <sub>2</sub> +2 wt% MCAS glass	1250	Composite	8.6	9580	5	208
366	(Mg <sub>1/2</sub> Zn <sub>1/2</sub> )Al <sub>2</sub> O <sub>4</sub>	1600/4h	Spinel Cubic Fd3m	8.6	95000	−52	209
367	Ca <sub>2</sub> SiO <sub>4</sub>	1450	Orthorhombic P2 <sub>1</sub> /n	8.6	26100	−89	210
368	SrW <sub>1-x</sub> Te <sub>x</sub> O <sub>4</sub> (x=0.2)	800	Scheelite Tetragonal I4 <sub>1</sub> /a	8.6	38400		206
369	SrW <sub>1-x</sub> Te <sub>x</sub> O <sub>4</sub> (x=0.0)	900	Scheelite Tetragonal I4 <sub>1</sub> /a	8.6	37900	−57	206
370	0.96Sr <sub>2</sub> Al <sub>2</sub> SiO <sub>7</sub> -0.04CaTiO <sub>3</sub>	1500	Tetragonal P-42 <sub>1</sub> m	8.6	20400	9	119
371	LiSrBO <sub>3</sub>	800	Monoclinic P2 <sub>1</sub> /c	8.6	60000	−39	211
372	Li <sub>4</sub> WO <sub>5</sub>	890	Orthorhombic rocksalt	8.6	23100	11 −3	212
373	LiCaBO <sub>3</sub>	800	Orthorhombic Pbca	8.7	75000	−150	211
374	ZnMoO <sub>4</sub>	800	Wolframite Triclinic P-1	8.7	49900	−87	113
375	CaWO <sub>4</sub> +0.5 wt% Bi <sub>2</sub> O <sub>3</sub> +9 wt% H <sub>3</sub> BO <sub>3</sub>	850	Scheelite Tetragonal I4 <sub>1</sub> /a	8.7	70220	−15	213
376	CaWO <sub>4</sub>	1200	Scheelite Tetragonal I4 <sub>1</sub> /a	8.7	75000	−54	150
377	(Al <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>2</sub>	1600	Tetragonal P4/nmm	8.7	60800	−55	214
378	Ca-Al-B-Si-O+Al <sub>2</sub> O <sub>3</sub> (K8)	870	Composite	8.7	900	3 −	215
379	NdPO <sub>4</sub>	1300	Monoclinic P2 <sub>1</sub> /n	8.7	59500	−47	146
380	(Mg <sub>0.95</sub> Ni <sub>0.005</sub> ) <sub>2</sub> SnO <sub>4</sub>	1550/4h	Cubic Spinel Fd3m	8.7	103100	−63	216
381	ZnAl <sub>2</sub> O <sub>4</sub> SPS		Spinel Cubic Fd3m	8.7	57000		151
382	SrW <sub>1-x</sub> Te <sub>x</sub> O <sub>4</sub> (x=0.1)	800	Scheelite I4 <sub>1</sub> /a	8.7	40300		206
383	(Mg <sub>1/2</sub> Co <sub>1/2</sub> )Al <sub>2</sub> O <sub>4</sub>	1600	Spinel Cubic Fd3m	8.8	107300	−54	217

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No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
384	$\text{Sr}_2\text{MnSi}_2\text{O}_7$	1375	Akermite Tetragonal P4-2 <sub>1</sub> m	8.8	32000		-59	133
385	$\text{Ca}_{0.5}\text{Sr}_{0.5}\text{Zr}_4\text{P}_6\text{O}_{24}$	1400	Trigonal R-3	8.8	1200	11	-32	218
386	$\text{Li}_2\text{Mo}_4\text{O}_{13}$	520	Anorthic P-1	8.8	7700	10.7	-66	30
387	$x\text{MgO}-(1-x)\text{B}_2\text{O}_3$ ( $x=0.95$ )	1350/4h	Orthorhombic Pnmm	8.8	432000		-55	93
388	$\text{BaO-ZnO-SiO}_2$	1275	Composite	8.8	34000		-58	133
389	$\text{Sr}_2\text{ZnSi}_2\text{O}_7+2$ wt% $\text{SrTiO}_3$	1450	Akermite Tetragonal P4-2 <sub>1</sub> m	8.8	60000		-13	133
390	$0.4\text{Ba}_3(\text{VO}_4)_2-0.6\text{Mg}_2\text{SiO}_4$	1200	Composite	8.8	55900		-1	188
391	$(\text{Zn}_{0.8}\text{Mg}_{0.2})_2\text{SiO}_4\text{-TiO}_2+3$ wt% $\text{Li}_2\text{O-B}_2\text{O}_3$	900	Mixed phases	8.8	15500		18	219
392	$\text{CaO-Al}_2\text{O}_3\text{-SiO}_2\text{-B}_2\text{O}_3+\text{Al}_2\text{O}_3$	900	Composite	8.8	1500			220
393	$\text{Zn}_2\text{SnO}_4+0.5$ wt% $\text{BaCuB}_2\text{O}_5$	1150/4h	Spinel Fd-3m	8.8	30900		-88	221
394	$\text{Li}_2\text{Mg}_3\text{SnO}_6$	1360	Cubic rocksalt Fm-3m	8.8	123000	10.7	-32	222
395	$\text{Sr}_2\text{CoSi}_2\text{O}_7$	1375	Akermite Tetragonal P4-2 <sub>1</sub> m	8.9	34000		-57	133
396	$\text{ZnO-B}_2\text{O}_3\text{-SiO}_2\text{-MMT-20}$ (46.34:17.09:6.85:29.72)	900	Composite	8.9	7000	8	-24	197
397	$\text{CaGeO}_3$	1200	Orthorhombic Pbnm	8.9	32200	10		223
398	$\text{ZnO-B}_2\text{O}_3\text{-SiO}_2\text{-MMT-20}$ (44.97:17.2:6.9:29.93)	900	Composite	8.9	810	8	-15	177,197
399	$\text{ZnO-B}_2\text{O}_3\text{-SiO}_2\text{-MMT-20}$ (46.34:17.09:6.85:29.72)	900	Composite	8.9	800	8	-24	177,197
400	$\text{ZnTiO}_3+1$ wt% $\text{B}_2\text{O}_3$	900/4h	Trigonal R-3	8.9	49000		-32	224
401	$\text{CaSiO}_3+1$ wt% $\text{Al}_2\text{O}_3+1.5$ wt% $\text{Li}_2\text{CO}_3+0.2$ wt% $\text{CuO}+10$ wt% $\text{CaTiO}_3$	900	Composite	8.9	19800		-1	225
402	$\text{Mg}(\text{Al}_{1-x}\text{Ga}_x)_2\text{O}_4$ ( $x=0.6$ )	1485	Cubic Fd3m	8.9	107000	14.8	-16	226
403	$\text{LiMgVO}_4$	700/4h	Orthorhombic	8.9	23300	10.2	-140	227
404	$x\text{MgO}-(1-x)\text{B}_2\text{O}_3$ ( $x=0.97$ )	1350/4h	Orthorhombic Pnmm	9.0	547700		-55	93
405	$\text{Ca}_{1-x}\text{Cd}_x\text{MoO}_4$ ( $x=0.2$ )		Scheelite Tetragonal I4 <sub>1</sub> /a	9.0	32500		-40	165
406	$\text{BaWO}_4$		Scheelite Tetragonal I4 <sub>1</sub> /a	9.0	32200			228
407	$\text{BaMoO}_4$	900	Scheelite Tetragonal I4 <sub>1</sub> /a	9.0	37100		-90	229

408	SrWO <sub>4</sub>		Scheelite Tetragonal I4 <sub>1</sub> /a	9.0	62600			228
409	(1-x)Ba <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub> -xMg <sub>2</sub> SiO <sub>4</sub> (x=0.55)	1175	Composite	9.0	52500		0	188
410	ZnO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -MMT- 20(49.21:16.15:6.49:28.15)	900	Composite	9.0	7000	8	-62	197
411	Co <sub>3</sub> O <sub>4</sub> -Nb <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1010	Mixture	9.0	41000	7.5	-59	230
412	MgTiO <sub>3</sub> -CaTiO <sub>3</sub> -ZnO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub>		Composite	9.0	7000	7	-55	197
413	PbO:B <sub>2</sub> O <sub>3</sub> :SiO <sub>2</sub> (30:60:10) glass		Glass	9.0	1700	13.5	-15	92
414	5ZnO-Ta <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1150	Composite	9.0	9000	7.9	-45	230
415	0.9CaWO <sub>4</sub> -0.1Li <sub>2</sub> WO <sub>4</sub>	1150	Composite	9.0	117600		-55	231
416	Yb <sub>2</sub> BaNiO <sub>5</sub>		Orthorhombic Pnma	9.1	44600		-37	149
417	K <sub>2</sub> O-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -CaO-SrO-BaO (glass)+Al <sub>2</sub> O <sub>3</sub>	900	Composite	9.1	600	0.5	0	232
418	Yb <sub>2</sub> BaZnO <sub>5</sub>		Orthorhombic Pnma	9.1	44600		-38	149
419	DyPO <sub>4</sub>	1650/2h	Tetragonal I4 <sub>1</sub> /amd	9.1	28600		-17	146
420	$\alpha$ -Ca <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub>	1500/10min	Monoclinic P2 <sub>1</sub> /a	9.1	22000		-97	233
421	xMgO-(1-x)B <sub>2</sub> O <sub>3</sub> (x=0.96)	1350/4h	Orthorhombic Pnmn	9.1	473890		-57	93
422	CaSnSiO <sub>5</sub>	1525	Monoclinic A2/a	9.1	61000		35	234
423	Mg <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub>	950/50h	Orthorhombic Cmca	9.1	64100	-	-93	57
424	Zn <sub>2</sub> SiO <sub>4</sub> +11 wt% TiO <sub>2</sub>	1200	Composite	9.1	150800		-1	69
425	0.89Zn <sub>2</sub> SiO <sub>4</sub> -0.11TiO <sub>2</sub>		Composite	9.1	118000		1	235
426	Ba <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub> -0.2BaWO <sub>4</sub> +0.8 wt% B <sub>2</sub> O <sub>3</sub>	925	Composite	9.1	45500		-2	236
427	LiMgVO <sub>4</sub>	675/2h	Orthorhombic Cmcn	9.1	33700		-160	140
428	0.95Sr <sub>2</sub> Al <sub>2</sub> SiO <sub>7</sub> -0.05CaTiO <sub>3</sub>	1475	Gehlenite Tetragonal P-42 <sub>1</sub> m	9.2	14400		24	119
429	BaMoO <sub>4</sub>	800	Scheelite Tetragonal I4 <sub>1</sub> /a	9.2	26600		-17	49
430	CaO-MgO-SiO <sub>2</sub> -TiO <sub>2</sub> +1 wt% Li <sub>2</sub> CO <sub>3</sub> -V <sub>2</sub> O <sub>5</sub>	880	Composite	9.2	46200		1.3	128
431	xMgO-(1-x)B <sub>2</sub> O <sub>3</sub> (x=0.98)	1350/4h	Orthorhombic Pnmn	9.2	598370		-54	93
432	Ca <sub>1-x</sub> Cd <sub>x</sub> MoO <sub>4</sub> (x=0.4)	1025	Scheelite Tetragonal I4 <sub>1</sub> /a	9.2	38500		-40	165
433	BaO:B <sub>2</sub> O <sub>3</sub> :SiO <sub>2</sub> (50:40:10) glass	<800	Glass	9.2	1220	13.1	-43	92
434	Ca <sub>5</sub> Mg <sub>4</sub> (VO <sub>4</sub> ) <sub>6</sub>	800	Cubic garnet Ia-3d	9.2	53300	10.6	-50	237
435	Y <sub>2</sub> BaCu <sub>0.9</sub> Mg <sub>0.1</sub> O <sub>5</sub>	1250	Orthorhombic Pbnm	9.2	36798		-36	123

(continued)



No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
436	(1-x)LiYW <sub>2</sub> O <sub>8</sub> -xBaWO <sub>4</sub> +y wt% B <sub>2</sub> O <sub>3</sub> (x=0.48, y=0.5)	930	Mixed phases	9.2	28100		-52	48
437	0.88CaMgSi <sub>2</sub> O <sub>5</sub> -0.12CaTiO <sub>3</sub> +1 wt% Li <sub>2</sub> CO <sub>3</sub> -V <sub>2</sub> O <sub>5</sub>	880/2h	Composite	9.2	46200		1	128
438	1.8MgO-1.2Al <sub>2</sub> O <sub>3</sub> -2.8SiO <sub>2</sub> -1.2TiO <sub>2</sub> - 0.4La <sub>2</sub> O <sub>3</sub>	1200	Composite	9.2	28600		-99	238
439	SmBO <sub>3</sub>		Vaterite Hexagonal P6 <sub>3</sub> /mmc	9.3	11000			135
440	LiMgPO <sub>4</sub> +0.1 wt% TiO <sub>2</sub>	950	Orthorhombic Pmnb	9.3	45400		-12	67
441	0.84MgAl <sub>2</sub> O <sub>4</sub> -0.16TiO <sub>2</sub>	1410	Composite	9.3	82200	10.1	-27	187
442	BaMoO <sub>4</sub>	900	Scheelite Tetragonal I41/a	9.3	37200		-79	113
443	Zn <sub>2</sub> SiO <sub>4</sub> +11 wt% TiO <sub>2</sub>	1250	Composite	9.3	113000		1	73
444	xMgO-(1-x)B <sub>2</sub> O <sub>3</sub> (x=0.993)	1350/4h	Orthorhombic Pnmn	9.3	773700		-55	93
445	xMgO-(1-x)B <sub>2</sub> O <sub>3</sub> (x=0.995)	1350/4h	Orthorhombic Pnmn	9.3	551700		-56	93
446	xMgO-(1-x)B <sub>2</sub> O <sub>3</sub> (x=0.999)	1350/4h	Cubic Fm3m	9.3	380400		-56	93
447	Ca(Sn <sub>0.4</sub> Si <sub>0.6</sub> )O <sub>3</sub>	1450	Monoclinic P2 <sub>1</sub> /a	9.3	63000		-52	155
448	0.8ZnAl <sub>2</sub> O <sub>4</sub> -0.2Co <sub>2</sub> TiO <sub>4</sub>		Spinal Cubic Fd3m	9.3	147000		-65	239
449	Ba <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub> +40 wt% Zn <sub>1.87</sub> SiO <sub>3.87</sub>	1100	Composite	9.3	23000		0	240
450	Zn <sub>2</sub> SnO <sub>4</sub> +1 wt% B <sub>2</sub> O <sub>3</sub>	975	Cubic Fd3m	9.3	62000		-59	241
451	Al <sub>2</sub> O <sub>3</sub> +20 wt% CaSiO <sub>3</sub>	1325	Composite	9.4	13700			242
452	Ba <sub>3</sub> MgSb <sub>2</sub> O <sub>9</sub>		Complex perovskite Hexagonal P6 <sub>3</sub> /mmc	9.4	6700	8.98		243
453	0.84Al <sub>2</sub> O <sub>3</sub> -0.16TiO <sub>2</sub> +4 wt% MCAS glass	1250	Composite	9.4	8200		10	200
454	Y <sub>2</sub> BaCuO <sub>5</sub>		Orthorhombic Pbnm	9.4	3830	12	-35	244
455	$\alpha$ -Ca <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub> Fluoro apatite	1500/8h	Trigonal R-3m	9.4	15200		-97	233
456	0.88CaMgSi <sub>2</sub> O <sub>5</sub> -0.12CaTiO <sub>3</sub>	1300/2h	Composite	9.4	50800		6	128
457	Mg <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub>	1050	Orthorhombic Cmca	9.4	65500		-90	57
458	MgCo <sub>2</sub> (VO <sub>4</sub> ) <sub>2</sub>	900/5h	Orthorhombic Cmca	9.4	78900		-95	245
459	SrMoO <sub>4</sub>	1050	Scheelite Tetragonal I4 <sub>1</sub> /a	9.5	61000		-67	113
460	La <sub>2</sub> O <sub>3</sub> -2B <sub>2</sub> O <sub>3</sub> -0.5ZnO+La <sub>2</sub> O <sub>3</sub> -3B <sub>2</sub> O <sub>3</sub> - 0.5ZnO	900	Glass	9- 10	72000	13		169

461	BaO:B <sub>2</sub> O <sub>3</sub> :SiO <sub>2</sub> (50:30:20) glass		Glass	9.5	1256	13.5	-95	92
462	Y <sub>2</sub> BaCu <sub>0.8</sub> Mg <sub>0.2</sub> O <sub>5</sub>		Orthorhombic Pbnm	9.5	42300	-38		123
463	(1-x)Ba <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub> -xMg <sub>2</sub> SiO <sub>4</sub> (x=0.5)	1175	Composite	9.5	46600		6	188
464	Li <sub>3</sub> AlMo <sub>3</sub> O <sub>12</sub>	570	Lyonsite Pseudo-hexagonal	9.5	50000	14.1	-73	207
465	Ca <sub>1-x</sub> Cd <sub>x</sub> MoO <sub>4</sub> (x=0.6)	1000	Scheelite Tetragonal I4 <sub>1</sub> /a	9.5	35700		-48	165
466	Sr <sub>2</sub> SiO <sub>4</sub>	1575	Monoclinic P2 <sub>1</sub> /n	9.5	19100		-205	210
467	CaMoO <sub>4</sub> -xY <sub>2</sub> O <sub>3</sub> -xLi <sub>2</sub> O (x=0.306)	775	Composite	9.5	63200		7	246
468	MgGa <sub>2</sub> O <sub>4</sub>	1410	Spinel Fd3m	9.5	117000	14.7	-4	247
469	LiMgVO <sub>4</sub>	700	Orthorhombic Cmc	9.5	34800		-146	248
470	LiMg <sub>0.9</sub> Zn <sub>0.1</sub> PO <sub>4</sub> +0.1 Vt TiO <sub>2</sub>	950	Orthorhombic Pmnb Olivine type	9.5	69500		-15	82
471	CaWO <sub>4</sub> +0.12 wt% BaCu(B <sub>2</sub> O <sub>5</sub> )	875		9.5			-41	249
472	0.75Li <sub>2</sub> ZnSiO <sub>4</sub> -0.25CaTiO <sub>3</sub> +25 wt% ZnO-B <sub>2</sub> O <sub>3</sub>	950	Composite	9.5	11800	7.8	-5	250
473	0.79ZnAl <sub>2</sub> O <sub>4</sub> -0.21 Mg <sub>2</sub> TiO <sub>4</sub>	1550	Composite	9.6	160800		-65	251
474	0.79ZnAl <sub>2</sub> O <sub>4</sub> -0.21Mn <sub>2</sub> TiO <sub>4</sub>	1300 SPS	Composite	9.6	30630		-	151
475	0.96 MgO-0.04LiF	950	Cubic Fm3m	9.6	282230		-63	252
476	Ba <sub>3</sub> CaSb <sub>2</sub> O <sub>9</sub>		Complex perovskite Monoclinic C2/c	9.6	3400	9.2		243
477	SrDy <sub>4</sub> Si <sub>3</sub> O <sub>13</sub>	1475/4h	Hexagonal apatite P6 <sub>3</sub> /m	9.6	9200		28	253
478	BaO:B <sub>2</sub> O <sub>3</sub> :SiO <sub>2</sub> (50:20:30) glass		Glass	9.6	1310	14.3	-114	92
479	Ba <sub>3</sub> V <sub>4</sub> O <sub>13</sub>	6001h	Monoclinic I2/a	9.6	56000		-42	254
480	Ba <sub>2</sub> V <sub>2</sub> O <sub>7</sub>	840/1h	Triclinic	9.6	30300		-32	255
481	Zn <sub>2</sub> (Sn <sub>0.99</sub> Zr <sub>0.01</sub> )O <sub>4</sub>	1225/4h	Cubic Fd-3m	9.6	87000		-51	256
482	RE mixPO <sub>4</sub>	1250	Monoclinic P2 <sub>1</sub> /n	9.6	45200	13.5	-35	257
483	Ca(Mg <sub>0.92</sub> Al <sub>0.08</sub> )(Si <sub>0.96</sub> Al <sub>0.04</sub> ) <sub>2</sub> O <sub>6</sub> +10 wt% CaTiO <sub>3</sub>	1250	Mixture	9.6	32600		-1	258
484	ZnO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -MMT-20(44.77:17.59:7.05:30.59)	900	Composite	9.7	7000	8	9	197
485	CrTaO <sub>4</sub>		Rutile type Tetragonal P4 <sub>2</sub> /mnm	9.7	1600	4		53
486	Y <sub>2</sub> BaCu <sub>0.6</sub> Ni <sub>0.4</sub> O <sub>5</sub>	1270/3h	Orthorhombic Pnma	9.7	36000		-27	259

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
487	$\beta$ -Ca <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub>	1125/8h	Rhombohedral R3C	9.7	10300		-47	233
488	0.79ZnAl <sub>2</sub> O <sub>4</sub> -0.21 Mn <sub>2</sub> TiO <sub>4</sub>	1400	Composite	9.7	23500		-63	251
489	(K <sub>0.5</sub> Sm <sub>0.5</sub> )MoO <sub>4</sub>	800/2h	Monoclinic I2/b	9.7	20000		-65	260
490	Al <sub>2</sub> O <sub>3</sub> +1500 ppm MgO+300 ppm La <sub>2</sub> O <sub>3</sub>			9.7	300000			261
491	0.55Ba <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub> -0.45LiMgPO <sub>4</sub>	850	Composite	9.7	50700		1	262
492	0.8LiZnVO <sub>4</sub> -0.2TiO <sub>2</sub>	640	Composite	9.7	39200		-20	140
493	Li <sub>3</sub> InMo <sub>3</sub> O <sub>12</sub>	630	Lyonsite Orthorhombic Pcn	9.8	36000	15	-73	207
494	CaSiO <sub>3</sub> +1 wt% Al <sub>2</sub> O <sub>3</sub> +10 wt% CaTiO <sub>3</sub> +1 wt% Li <sub>2</sub> CO <sub>3</sub> -CuO	900	Composite	9.8	19800		-1	263
495	LiMgVO <sub>4</sub> (Using V <sub>2</sub> O <sub>5</sub> )	810	Orthorhombic Cmc	9.8	26500		-166	132
496	LiMgVO <sub>4</sub> (Using NH <sub>3</sub> VO <sub>3</sub> )	720	Orthorhombic Cmc	9.9	30800		-171	132
497	Y <sub>2</sub> BaCu <sub>0.8</sub> Mg <sub>0.2</sub> O <sub>5</sub> CIP	1250	Orthorhombic Pbnm	9.9	49200	12.8	-40	123
498	(K <sub>0.5</sub> Nd <sub>0.5</sub> )MoO <sub>4</sub>	760/2h	Monoclinic I2/b	9.9	69000		-62	260
499	(Mg <sub>1/2</sub> Ca <sub>1/2</sub> )WO <sub>4</sub> +1 wt% Li <sub>2</sub> WO <sub>4</sub>	950	Wolframite P2/c	9.9	30150		-63	48
500	MgWO <sub>4</sub>	950	Wolframite Monoclinic P2/c	9.9	5400			264
501	0.79ZnAl <sub>2</sub> O <sub>4</sub> -0.21 Co <sub>2</sub> TiO <sub>4</sub>	1500	Spinel cubic Fd3m	9.9	94000		-66	251
502	Ca <sub>1-x</sub> Cd <sub>x</sub> MoO <sub>4</sub> (x=0.8)	925	Sheelite Tetragonal I41/a	9.9	34000		-50	165
503	CaW <sub>1-x</sub> Te <sub>x</sub> O <sub>4</sub> (x=0.05)	900	Scheelite Tetragonal I4 <sub>1</sub> /a	9.9	53600			206
504	Sr <sub>2</sub> V <sub>2</sub> O <sub>7</sub> +1 mol% Li <sub>2</sub> CO <sub>3</sub>	800	Anorthic P-1	9.9	73800		-29	265
505	0.96CaWO <sub>4</sub> -0.04Na <sub>2</sub> W <sub>2</sub> O <sub>7</sub>	875	Wolframite Monoclinic P2/c	9.9	64400			266
506	Nd <sub>4</sub> Si <sub>3</sub> O <sub>12</sub>	1450	Hexagonal P6 <sub>3</sub> /m	9.9	6300	11.7	-12	154
507	Zn <sub>2</sub> (Sn <sub>0.95</sub> Ti <sub>0.05</sub> )O <sub>4</sub>	1225/4h		9.9	76900		-38	267
508	Li(Mg <sub>1-x</sub> Ni <sub>x</sub> )PO <sub>4</sub> (x=0.05)	875	Orthorhombic	9.9	50800		-1	99
509	LiMg <sub>0.95</sub> Ni <sub>0.05</sub> PO <sub>4</sub> +11 wt% TiO <sub>2</sub>	875	Orthorhombic olivine type	9.9	50800		-1	99
510	Na <sub>6</sub> Mo <sub>11</sub> O <sub>36</sub>	510	Anorthic P-1	9.9	57000		-68	11
511	BiCaVO <sub>6</sub>	900	Cmc2 <sub>1</sub>	9.9	23600		-71	540
512	CaWO <sub>4</sub>	1290	Wolframite Monoclinic P2/c	10.0	50800		-50	264,266
513	LiMgPO <sub>4</sub> +0.12TiO <sub>2</sub>	950	Composite	10.0	26900		1	67
514	Ba <sub>3</sub> Nb <sub>2</sub> P <sub>4</sub> O <sub>18</sub>	1150	P-1	10.0	58400		-34	268

515	0.83ZnAl <sub>2</sub> O <sub>4</sub> -0.17TiO <sub>2</sub> +10 wt% BBSZ glass	950	Composite	10.0	10000		-23	269
516	Al <sub>2</sub> O <sub>3</sub>	1400/8h	Trigonal R-3c	10.0	634000	14	-40	270
517	CaW <sub>1-x</sub> Te <sub>x</sub> O <sub>4</sub> (x=0.15)	850	Scheelite Tetragonal I4 <sub>1</sub> /a	10.0	42000		-61	206
518	0.5Ba <sub>3</sub> (VO <sub>4</sub> )-0.5Zn <sub>1.87</sub> SiO <sub>3.87</sub> +3 wt% B <sub>2</sub> O <sub>3</sub>		Composite	10.0	40800		0.5	271
519	TiO <sub>2</sub> -CaAlSi <sub>2</sub> O <sub>8</sub>	960/0.5h	Composite	10.0	22500		-10	163
520	Y <sub>2</sub> Ba(Cu <sub>0.8</sub> Mg <sub>0.2</sub> )O <sub>5</sub> (CIP)			10.0	49180		-40	123
521	CAS-T10 glass (CaO:Al <sub>2</sub> O <sub>3</sub> :SiO <sub>2</sub> :TiO <sub>2</sub> :B <sub>2</sub> O <sub>3</sub> )	950	Composite	10.0	22500	10	-15	163
522	Al <sub>2</sub> O <sub>3</sub> +0.5 wt% TiO <sub>2</sub>	1550/5h	Composite	10.0	453000	9		272
523	Al <sub>2</sub> O <sub>3</sub>	1550/5h	Trigonal R-3c	10.0	335000		-60	272
524	CaO-4ZnO-Ta <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1225	Mixture	10.0	15000	8.4	-60	230
525	Mg <sub>4</sub> Nb <sub>2</sub> O <sub>9</sub> +3 wt% LiF	950/10H	Corundum type Hexagonal P-3c1	10.0	116420		-72	273
526	LiMgPO <sub>4</sub> +0.12 vfTiO <sub>2</sub>	950	Orthorhombic Pmnb	10.0	26900		-1	67
527	Mg <sub>4</sub> Ta <sub>2</sub> O <sub>9</sub>	1450	Corundum trigonal P-3c1	10.0	345000		-70	274
528	Al <sub>2</sub> O <sub>3</sub> +500 ppm TiO <sub>2</sub>		Hexagonal R-3c	10.0	500000	10		275
529	Mg <sub>4</sub> NbSbO <sub>9</sub>	1450/10h	Corundum type P-3c1	10.0	280000		-70	276
530	BaTeO <sub>3</sub>	800	Orthorhombic Pnma	10.0	34000		-54	277
531	Sm <sub>2</sub> Si <sub>2</sub> O <sub>7</sub>	1375	Tetragonal P4 <sub>1</sub>	10.0	2000	10		97
532	Al <sub>2</sub> O <sub>3</sub> +0.015 vf TiO <sub>2</sub>		Composite	10.0	300000	10	0	278
533	CaWO <sub>4</sub>	1150	Scheelite Tetragonal I4 <sub>1</sub> /a	10.0	75000		-24	150,279
534	NaCa <sub>2</sub> Mg <sub>2</sub> V <sub>3</sub> O <sub>12</sub>	915/4h	Cubic garnet Ia3d	10.0	50600		-47	280
535	45Vol% LiMg <sub>0.9</sub> Zn <sub>0.1</sub> PO <sub>4</sub> +Ba <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub>	800	Composite	10.0	64500		-2	281
536	LiMg <sub>0.95</sub> Co <sub>0.05</sub> PO <sub>4</sub> +16.1 wt% TiO <sub>2</sub>	875/2h	Composite	10.0	58200		1	111
537	Al <sub>2</sub> O <sub>3</sub>	1550	Hexagonal R-3c	10.1	680000		-60	201
538	Y <sub>2</sub> BaCu <sub>0.1</sub> Ni <sub>0.9</sub> O <sub>5</sub>		Orthorhombic Immm	10.1	5830	12.3	-36	58
539	Mg <sub>5</sub> Nb <sub>4</sub> O <sub>15</sub>		A <sub>n</sub> B <sub>n-1</sub> O <sub>3n</sub> perovskite Orthorhombic	10.1	32300		-24	282
540	CaW <sub>1-x</sub> Te <sub>x</sub> O <sub>4</sub> (x=0.05)	850	Scheelite Tetragonal I4 <sub>1</sub> /a	10.1	40500		-61	206

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
541	$\text{CaW}_{1-x}\text{Te}_x\text{O}_4$ ( $x=0.2$ )	850	Scheelite Tetragonal $I4_1/a$	10.1	44300		-60	206
542	$\text{Ca}_{1-x}\text{Cd}_x\text{MoO}_4$ ( $x=1$ )	900	Tetragonal $I4_1/a$	10.1	53200		-57	165
543	$\text{LiMg}_{0.9}\text{Zn}_{0.1}\text{PO}_4+0.12 \text{ Vf TiO}_2$	950	Orthorhombic Pmnb Olivine type	10.1	52900		-5	82
544	$\text{La}_2\text{Mo}_3\text{O}_{12}$	930	Monoclinic C2/c	10.1	60000		-80	178
545	$0.55\text{Li}_2\text{WO}_4-0.45\text{TiO}_2$	730	Mixture	10.1	32800		-17	283
546	$\text{Ca}_5\text{Co}_4(\text{VO}_4)_6$	875	Cubic garnet Ia-3d	10.1	95200	10.6	-63	284
547	$\text{CaMoO}_4-x\text{Y}_2\text{O}_3-x\text{Li}_2\text{O}$ ( $x=0.066$ )	775	Composite	10.1	66000		-57	246
548	$\text{AlTeO}_6\text{-TeO}_2$	900/2h+ anneal/750		10.2	24300	13.3		285
549	$\text{Y}_3\text{Al}_5\text{O}_{12}+1.3 \text{ wt\% TiO}_2$	1550	Garnet Cubic Ia3d	10.2	80100		-30	286
550	$\text{Bi}_6\text{B}_{10}\text{O}_{24}$	700	Orthorhombic Pnma	10.2	10750		-41	287
551	$0.9(0.79\text{ZnAl}_2\text{O}_4-0.21\text{Mg}_2\text{TiO}_4)-0.1\text{TiO}_2$	1450	Composite	10.2	158000		-64	288
552	$\text{Al}_2\text{O}_3\text{-TiO}_2$ doped		Trigonal R-3c	10.2	119150			289
553	$(1-x)\text{LiYW}_2\text{O}_8-x\text{BaWO}_4+y \text{ wt\% B}_2\text{O}_3$ ( $x=0.46, y=0.5$ )	900	Mixed phases	10.2	24300		-21	48
554	$\text{Ce}_2(\text{WO}_4)_3$	1025	Monoclinic C2/c	10.2	10500		-25	290
555	$\text{Ba}_3\text{ZrV}_4\text{O}_{15}$	800	Orthorhombic Pnma	10.2	30600	8.5	-102	291
556	$\text{CaV}_2\text{O}_6$	675		10.2	123000	10.2	-60	292
557	$0.88\text{ZnAl}_2\text{O}_4-0.12\text{TiO}_2$	1380	Composite	10.3	79800	11.1	-22	198
558	$\text{Mg}_3\text{Yb}_4\text{Al}_{44}\text{O}_{75}$	1680	Magnetoplumbite	10.3	41000		-57	145
559	$\text{Mg}_3\text{Dy}_4\text{Al}_{44}\text{O}_{75}$	1680	Magnetoplumbite	10.3	28000		-49	145
560	$\text{CaMo}_{1.02}\text{O}_4$	1300/2h	Tetragonal $I4_1/a$	10.3	71000			293
561	$\text{NdPO}_4$	1300/2h	$\text{P}12_1/\text{n}1$ Monozite	10.3	59500		-47	146
562	$\text{SmPO}_4$	1400	Monoclinic $\text{P}2_1/\text{n}$	10.3	60500		-54	146
563	$\text{Li}_3\text{SbO}_4+1 \text{ wt\% B}_2\text{O}_3$	930	Monoclinic $\text{P}2/\text{c}$	10.3	14600	13.5	-28	294
564	$\text{BaLa}_2(\text{MoO}_4)$	800	Monoclinic	10.3	29800		-76	295
565	$(\text{K}_{0.5}\text{La}_{0.5})\text{MoO}_4$	680	Tetragonal $I4_1/a$	10.3	59000		-81	296
566	$\text{Yb}_3\text{Al}_2\text{O}_{12}$	1650	Cubic Garnet Ia-3d	10.3	12900		-70	297

567	LaPO <sub>4</sub>	1400	Monoclinic P2 <sub>1</sub> /n	10.4	64500		-56	146
568	SrEr <sub>4</sub> Si <sub>3</sub> O <sub>13</sub>	1500/4h	Hexagonal apatite P6 <sub>3</sub> /m	10.4	18100		-24	253
569	Sr <sub>2</sub> V <sub>2</sub> O <sub>7</sub>	1000	Anorthic P-1	10.4	19500		-35	299
570	Ba <sub>2</sub> V <sub>2</sub> O <sub>7</sub>	920/10h	Anorthic P-1	10.4	51600		-20	299
571	Y <sub>3</sub> Al <sub>5</sub> O <sub>12</sub>	1650/24h	Cubic Ia3d	10.4	440000		-50	300
572	SrCe <sub>2</sub> (MoO <sub>4</sub> ) <sub>4</sub>	840		10.4	54100	8.08	-46	301
573	MgO-1.2Al <sub>2</sub> O <sub>3</sub> -2.8SiO <sub>2</sub> -1.2TiO <sub>2</sub> -0.8CeO <sub>2</sub>	1150/2h	Composite	10.4	15300		-5	302
574	ZnGa <sub>2</sub> O <sub>4</sub>	1385	Cubic spinel Fd3m	10.4	94600		-27	303
575	CaWO <sub>4</sub>	1100	Scheelite Tetragonal I4 <sub>1</sub> /a	10.4	76500		-24	49
576	CAS-TB glass (CaO:Al <sub>2</sub> O <sub>3</sub> :SiO <sub>2</sub> :TiO <sub>2</sub> :B <sub>2</sub> O <sub>3</sub> )	950	Composite	10.5	14200	10	-20	163
577	0.83ZnAl <sub>2</sub> O <sub>4</sub> -0.17TiO <sub>2</sub> +10 wt% BBSZ+0.3 wt% LiF	925/10	Composite	10.5	14500	5.5	-28	269
578	MgTe <sub>2</sub> O <sub>5</sub>	700/4h	Orthorhombic Pbcn	10.5	61000	5.3	-45	304
579	LiCa <sub>3</sub> MgV <sub>3</sub> O <sub>12</sub>	900	Cubic garnet Cubic Ia3d	10.5	74700		-61	305
580	Mg <sub>2</sub> V <sub>2</sub> O <sub>7</sub>	950/10h	Triclinic Anorthic P-1	10.5	58200		-27	306
581	Er <sub>3</sub> Al <sub>12</sub> O <sub>12</sub>	1600	Cubic Garnet Ia-3d	10.5	11700		-45	297
582	Yb <sub>3</sub> Al <sub>2</sub> O <sub>12</sub> +1 wt% Ga <sub>2</sub> O <sub>3</sub>	1600	Cubic Garnet	10.5	50000		-50	297
583	Na <sub>0.5</sub> Nd <sub>0.5</sub> MoO <sub>4</sub>	760		10.5	19600	9.15	-49	307
584	0.96CaWO <sub>4</sub> -0.04YLiF <sub>4</sub>	750/2h		10.5	73000		-38	308
585	0.83ZnAl <sub>2</sub> O <sub>4</sub> -0.17TiO <sub>2</sub> +15 wt% BBSZ glass	950/10h	Composite	10.6	9300	5.5	-29	269
586	MgTiO <sub>3</sub> -CaTiO <sub>3</sub> (MMT-20)+ SiO <sub>2</sub> -B <sub>2</sub> O <sub>3</sub> -BaO	900	Composite	10.6	6000	7		177
587	Ca <sub>3</sub> ZrSi <sub>2</sub> O <sub>9</sub>	1400	Monoclinic P2 <sub>1</sub> /a	10.6	93300		-77	189
588	CaZrB <sub>2</sub> O <sub>6</sub> +3 wt% Bi <sub>2</sub> O <sub>3</sub> -CuO	925		10.6	87350		2	173
589	Ba <sub>3</sub> SrSb <sub>2</sub> O <sub>9</sub>		Complex perovskite Triclinic P-I	10.6	4600	9		243
590	0.8SrMoO <sub>4</sub> -TiO <sub>2</sub> +3 wt% H <sub>3</sub> BO <sub>3</sub> -CuO	875	Composite	10.6	72000		-19	309
591	Y <sub>2</sub> BaCu <sub>0.7</sub> Mg <sub>0.3</sub> O <sub>5</sub> CIP	1250	Orthorhombic Pbnm	10.6	29300	12.3	-44	123
592	0.8BaMoO <sub>4</sub> -0.2TiO <sub>2</sub>	1275	Composite	10.6	51800		-56	229

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
593	0.55Li <sub>2</sub> MoO <sub>4</sub> -0.45TiO <sub>2</sub>	700	Mixture	10.6	30000		-5	283
594	0.75MgAl <sub>2</sub> O <sub>4</sub> -0.25TiO <sub>2</sub>	1450	Composite	10.7	105400	7.5	-12	195
595	CoWO <sub>4</sub>	1200	Wolframite Monoclinic P2/c	10.7	38600			264
596	0.87[0.79ZnAl <sub>2</sub> O <sub>4</sub> -0.21Co <sub>2</sub> TiO <sub>4</sub> ]-0.13TiO <sub>2</sub>	1350	Composite	10.7	86700		-62	310
597	Ba <sub>3</sub> ZrV <sub>4</sub> O <sub>15</sub>	800	Orthorhombic Pnma	10.7	30600		-106	291
598	Sm <sub>2</sub> Mo <sub>4</sub> O <sub>15</sub>	690	Triclinic (PI-)	10.7	63500	11.6	-50	311
599	LiMg <sub>4</sub> V <sub>3</sub> O <sub>12</sub>	740/4h	Tetragonal	10.7	24000	9.65	-12	312
600	BaZnV <sub>2</sub> O <sub>7</sub>	720	Orthorhombic	10.7	31000	11.7	-64	182
601	0.9ZnAl <sub>2</sub> O <sub>4</sub> -0.08CaTiO <sub>3</sub>		Composite	10.8	32300		0	313
602	CaMoO <sub>4</sub>	1100	Scheelite Tetragonal I4 <sub>1</sub> /a	10.8	89700		-23	49,228
603	Nano Al <sub>2</sub> O <sub>3</sub> +0.5 wt% TiO <sub>2</sub>	1400	Trigonal R-3c	10.8	680000	14		314
604	CaCu <sub>2</sub> Nb <sub>2</sub> O <sub>8</sub> +3 wt% V <sub>2</sub> O <sub>5</sub>	935		10.8	9300		-16	315
605	Er <sub>3</sub> Al <sub>2</sub> O <sub>12</sub> +1 wt% Ga <sub>2</sub> O <sub>3</sub>	1550	Cubic Garnet	10.8	12600		-37	297
606	CaGe <sub>2</sub> O <sub>5</sub>	1180	Monoclinic Pbam	10.9	39000	10		223
607	Y <sub>3</sub> Al <sub>2</sub> O <sub>12</sub> +1 wt% Ga <sub>2</sub> O <sub>3</sub>	1600	Cubic Garnet	10.9	25000		-33	297
608	0.7Ca <sub>2</sub> P <sub>2</sub> O <sub>7</sub> -0.3TiO <sub>2</sub>	1200/2h	Composite	10.9	44000		-11	316
609	0.83ZnAl <sub>2</sub> O <sub>4</sub> -0.17TiO <sub>2</sub> +10 wt% BBSZ glass	950/10h	Composite	10.9	12000	5.5	-23	269
610	Ba <sub>2</sub> V <sub>2</sub> O <sub>7</sub> +6 mol% Li <sub>2</sub> CO <sub>3</sub>	750	Anorthic P-1	10.9	74500		-20	317
611	CaWO <sub>4</sub>		Scheelite tetragonal I4 <sub>1</sub> /a	10.9	105600			228
612	Sr <sub>2</sub> ZnTeO <sub>6</sub> +1 wt% ZnO-B <sub>2</sub> O <sub>3</sub> -P <sub>2</sub> O <sub>5</sub> -TeO <sub>2</sub> glass	950	Not available	10.9	4250		-57	318
613	Mg <sub>2</sub> YVO <sub>6</sub>	1290/4h	Tetragonal I4 <sub>1</sub> /amd	10.9	68300		-54	298
614	Ca <sub>2</sub> ZnSi <sub>2</sub> O <sub>7</sub>	1300	Tetragonal P-42 <sub>1</sub> m	11.0	13500		-64	133
615	MgO-Al <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -TiO <sub>2</sub> -CeO <sub>2</sub>	1100/2h	Composite	11.0	12100		26	320
616	0.76Mg <sub>2</sub> SiO <sub>4</sub> -0.24TiO <sub>2</sub>		Composite	11.0	85000		0	107,321
617	Mg <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub> -0.2Ba <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub>	950/5h	Composite	11.0	114000		-58	322
618	Sm <sub>2</sub> BaCuO <sub>5</sub> :Co		Orthorhombic Pnma	11.0	89000		-7	323
619	NdBO <sub>3</sub>		Aragonite Orthorhombic	11.0	17000			135

620	Ba <sub>2</sub> MgTeO <sub>6</sub> +0.2 wt% B <sub>2</sub> O <sub>3</sub>	1200	Orthorhombic Pnam	11.0	25000	5.5	-16	324
621	Sr <sub>2</sub> CaSi <sub>2</sub> O <sub>7</sub>	1300	Akermite Tetragonal P4-2 <sub>1</sub> m	11.0	13500		-64	133
622	Mg <sub>2</sub> SiO <sub>4</sub> +24 wt% TiO <sub>2</sub>	1200	Composite	11.0	82000		0	87
623	Al <sub>2</sub> O <sub>3</sub>	1550	Trgonal R-3c	11.0	680000		-65	235
624	TiO <sub>2</sub> -B <sub>2</sub> O <sub>3</sub> -: Ca-Al-Si-) glass		Glass	11.0	1400	10		163
625	Mg <sub>5</sub> Ta <sub>4</sub> O <sub>15</sub> (MgO calcined)	1560	Psuedo-brookite Orthorhombic Cmc	11.0	18100	9.06	-54	325
626	Mg <sub>5</sub> Nb <sub>4</sub> O <sub>15</sub> (MgO calcined)	1450	Psuedo-brookite Orthorhombic Cmc	11.0	37400	8.3	-53	325
627	Mg <sub>4</sub> Nb <sub>2</sub> O <sub>9</sub>	1300	Trigonal P-3c1	11.0	210000		-70	274
628	0.50Li <sub>2</sub> WO <sub>4</sub> -0.5TiO <sub>2</sub>	730	Mixture	11.0	32000		-3	283
629	TiP <sub>2</sub> O <sub>7</sub>	1250	Pyrophosphate	11.0	77000		-14	326
630	Na <sub>0.5</sub> La <sub>0.5</sub> MoO <sub>4</sub>	740/2h		11.0	25100	8.83	-59	327
631	0.81Mg <sub>2</sub> Si <sub>0.9</sub> V <sub>0.1</sub> O <sub>4</sub> -0.19Ca <sub>0.8</sub> Sr <sub>0.2</sub> TiO <sub>3</sub> +4 wt% LiF	900/4h	Multiphase	11.0	49000	9.5	-7	328
632	(Mg <sub>4-x</sub> Mn <sub>x</sub> )Nb <sub>2</sub> O <sub>9</sub>		Corundum Trigonal P-3c1	11-16	21000-50000			329
633	PbO:B <sub>2</sub> O <sub>3</sub> (40:60) glass	469Td	Glass	11.1	1320	12.22	-43	92
634	CePO <sub>4</sub>	1400/2h	Monoclinic P2 <sub>1</sub> /n	11.1	68500		-46	146
635	Nd <sub>4</sub> Mo <sub>4</sub> O <sub>15</sub>	700	Triclinic (P1 <sup>-</sup> )	11.1	61500	12	-44	311
636	0.35Ba <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub> -0.65BaWO <sub>4</sub>	925	Composite	11.1	79100		-2	330
637	0.8(0.79ZnAl <sub>2</sub> O <sub>4</sub> -0.21Mg <sub>2</sub> TiO <sub>4</sub> )-0.2TiO <sub>2</sub>	1450	Composite	11.1	155100		-62	288
638	Li <sub>2</sub> Zn <sub>2</sub> Mo <sub>3</sub> O <sub>12</sub>	630	Lyonsite Orthorhombic Pnma	11.1	70000	14.6	-90	207
639	0.8[0.79ZnAl <sub>2</sub> O <sub>4</sub> -0.21Co <sub>2</sub> TiO <sub>4</sub> ]-0.2TiO <sub>2</sub>	1350	Composite	11.1	98700		-63	310
640	Tb <sub>2</sub> Al <sub>2</sub> O <sub>12</sub> +1 wt% Ga <sub>2</sub> O <sub>3</sub>	1500	Cubic Garnet	11.1	30000		-32	297
641	Y <sub>3</sub> Al <sub>2</sub> O <sub>12</sub> +1 wt% Nb <sub>2</sub> O <sub>5</sub>	1625	Cubic Garnet	11.2	120000		-48	297
642	NiCu <sub>2</sub> Nb <sub>2</sub> O <sub>8</sub> +3 wt% V <sub>2</sub> O <sub>5</sub>	935		11.2	5760		-11	315
643	Cu <sub>3</sub> Nb <sub>2</sub> O <sub>8</sub>	910	Anorthic	11.2	25560		-4	315
644	SrTm <sub>4</sub> Si <sub>3</sub> O <sub>13</sub>	1650/4h	Monoclinic apatiteP2 <sub>1</sub> /m	11.2	14400		-20	253

(continued)



No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
645	SrEr <sub>4</sub> Si <sub>3</sub> O <sub>13</sub> +0.5 wt% ZBS glass		Hexagonal apatite P6 <sub>3</sub> /m	11.2	21000		-20	253
646	Ba <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub> -0.2BaWO <sub>4</sub>	1100	Composite	11.2	71985		1.5	236
647	Na <sub>0.5</sub> Ce <sub>0.5</sub> MoO <sub>4</sub>	780		11.2	19400	8.98	-44	331
648	Mg <sub>5</sub> Nb <sub>4</sub> O <sub>15</sub> Sol-gel	1300	Pseudo brookite Orthorhombic	11.3	43300		-58	332
649	0.7BaMoO <sub>4</sub> -0.3TiO <sub>2</sub>	1285	Composite	11.3	52600		-34	229
650	MgCu <sub>2</sub> Nb <sub>2</sub> O <sub>8</sub> +3 wt% V <sub>2</sub> O <sub>5</sub>	935		11.3	2900		-27	315
651	0.4Ba <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub> -0.6BaWO <sub>4</sub>	925	Composite	11.3	75100		3	330
652	0.83ZnAl <sub>2</sub> O <sub>4</sub> -0.17TiO <sub>2</sub> +3 wt% BBSZ	1300/4	Composite	11.3	35000		-14	269
653	Li <sub>2</sub> Zn <sub>2</sub> W <sub>3</sub> O <sub>12</sub>	700	Li <sub>2</sub> WO <sub>4</sub> +ZnWO <sub>4</sub>	11.3	24500		-100	193
654	ZnCu <sub>2</sub> Nb <sub>2</sub> O <sub>8</sub> +3 wt% V <sub>2</sub> O <sub>5</sub>	935	Not available	11.4	10200		-23	315
655	LiMgPO <sub>4</sub> +0.15 wt% TiO <sub>2</sub>	950	Orthorhombic Pmnb	11.4	21100		4	67
656	CaCe <sub>2</sub> (MoO <sub>4</sub> ) <sub>4</sub>	840	Not available	11.4	52100	6.9	-44	301
657	(1-x)Ba <sub>2</sub> V <sub>2</sub> O <sub>7</sub> -xBa <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub> (x=0.42)	875/4h	Composite	11.4	71700		-1	333
658	Li <sub>2</sub> SnO <sub>3</sub>	1325	Rock salt C2/c(15)	11.4	13100		14	334
659	Zn <sub>2</sub> SnO <sub>4</sub> +3 wt% ZnO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub>	1075/4h	Cubic spinel Fd-3m	11.4	33000		-107	335
660	BaPr <sub>2</sub> (MoO <sub>4</sub> ) <sub>4</sub>			11.5	24800			337
661	0.8SrMoO <sub>4</sub> -0.2TiO <sub>2</sub>	1300	Composite	11.5	19200		8	309
662	Y <sub>2</sub> BaCu <sub>0.4</sub> Ni <sub>0.6</sub> O <sub>5</sub>	1360/3h	Orthorhombic Pnma	11.5	45200	13.11	-20	259
663	BaTi(BO <sub>3</sub> ) <sub>2</sub>	1000/2h	Trigonal R-3	11.5	2300			338
664	Mg <sub>4</sub> Ta <sub>2</sub> O <sub>9</sub>	1450	Corundum Trigonal P-3c1	11.5	347000		-70	339
665	Yb <sub>3</sub> Ga <sub>5</sub> O <sub>12</sub>	1400	Garnet Cubic Ia3d	11.5	60300		-12	340
666	Mg <sub>4</sub> Nb <sub>0.5</sub> Ta <sub>1.5</sub> O <sub>9</sub>	1100	Corundum type Trigonal P-3c1	11.5	25520			339
667	0.8NaCa <sub>2</sub> Mg <sub>2</sub> V <sub>3</sub> O <sub>12</sub> -0.2CaTiO <sub>3</sub>	930/4h	Cubic garnet	11.5	37500		2	280
668	LiCa <sub>3</sub> ZnV <sub>3</sub> O <sub>12</sub>	900	Cubic Garnet	11.5	81100	-72	-	341
669	Li <sub>3</sub> FeMo <sub>3</sub> O <sub>12</sub>	580	Orthorhombic Pnma	11.5	12000		-20	342
670	(Na <sub>0.5</sub> Bi <sub>0.5</sub> ) <sub>0.1</sub> Ca <sub>0.9</sub> MoO <sub>4</sub>	850	Tetragonal Scheelite	11.5	35100		-52	343
671	BaY <sub>2</sub> (MoO <sub>4</sub> ) <sub>4</sub>	925/2h	Monoclinic	11.5	47200	10.3	-35	344
672	LiKSm <sub>2</sub> (MoO <sub>4</sub> ) <sub>4</sub>	620	Monoclinic Scheelite	11.5	39000		-16	345
673	Mg <sub>4</sub> (Nb <sub>2-x</sub> V <sub>x</sub> )O <sub>9</sub> (x=0.0625)	1025	Corundum type Trigonal P-3c1	11.6	160250		-75	346

674	0.83ZnAl <sub>2</sub> O <sub>4</sub> -0.17TiO <sub>2</sub> +1 wt% BBSZ glass	1300/4h	Composite	11.6	49000		-10	269
675	ZnAlO <sub>4</sub> -0.21TiO <sub>2</sub>	1500/3h	Composite	11.6	74000	6.5	0	347
676	CaCu <sub>2</sub> Nb <sub>2</sub> O <sub>8</sub>	1110		11.6	2300		-17	315
677	CePO <sub>4</sub>	1400/2h	Monoclinic P <sub>2</sub> <sub>1</sub> /n	11.6	68300		-46	146
678	SrEr <sub>4</sub> Si <sub>3</sub> O <sub>13</sub> +0.5 wt% LBS glass	1475/4h	Hexagonal apatite P <sub>6</sub> <sub>3</sub> /m	11.6	21000		-20	253
679	0.88Al <sub>2</sub> O <sub>3</sub> -0.12TiO <sub>2</sub> +8 wt% MCAS glass	1350	Composite	11.6	11500		-3	348
680	Ca <sub>2+x</sub> La <sub>8-x</sub> (SiO <sub>4</sub> ) <sub>6-x</sub> (PO <sub>4</sub> )O <sub>2</sub> (x=6)	1425/4h	Hexagonal P <sub>6</sub> <sub>3</sub> /m apatite	11.6	12700		-35	349
681	0.79ZnAl <sub>2</sub> O <sub>4</sub> -0.21TiO <sub>2</sub>	1500/3h	Composite	11.6	74000	6.5	0	350
682	0.95[0.79ZnAl <sub>2</sub> O <sub>4</sub> -0.21Co <sub>2</sub> TiO <sub>4</sub> ]-0.05SrTiO <sub>3</sub>	1425	Composite	11.6	49950		-2	310
683	0.95(0.79ZnAl <sub>2</sub> O <sub>4</sub> -0.21Mg <sub>2</sub> TiO <sub>4</sub> )-0.05SrTiO <sub>3</sub>	1450	Composite	11.6	55000		9	288
684	0.6LiYW <sub>2</sub> O <sub>8</sub> -0.4BaWO <sub>4</sub>	900	Mixed phases	11.7	19750		14	48
685	Ca <sub>5</sub> Zn <sub>4</sub> (VO <sub>4</sub> ) <sub>6</sub>	725	Cubic garnet Ia3d	11.7	49400	9.7	-83	237
686	Yb <sub>2</sub> Ba(Cu <sub>0.75</sub> Zn <sub>0.25</sub> )O <sub>5</sub>		Orthorhombic Pnma	11.7	11200		-43	149
687	BaDy(MoO <sub>4</sub> ) <sub>4</sub>		Monoclinic	11.7	11500			337
688	CaMoO <sub>4</sub> (hot pressed)	1100	Tetragonal scheelite I4 <sub>1</sub> /a	11.7	55000		-60	293
689	Ca <sub>0.8</sub> (Nd <sub>0.5</sub> Li <sub>0.5</sub> ) <sub>0.2</sub> WO <sub>4</sub>	825/2h	Tetragonal scheelite I4 <sub>1</sub> /a	11.7	36700		5	351
690	0.83ZnAl <sub>2</sub> O <sub>4</sub> -0.17TiO <sub>2</sub> +0.2 wt% BBSZ	1400/4	Mixture	11.7	120000		-7	269
691	0.83ZnAl <sub>2</sub> O <sub>4</sub> -0.17TiO <sub>2</sub> +0.1 wt% BBSZ	1425/4	Mixture	11.7	96000		-4	269
692	BaNd <sub>2</sub> (MoO <sub>4</sub> )	960	Monoclinic	11.7	45000	9.9	-41	352
693	LiMg <sub>0.9</sub> Zn <sub>0.1</sub> PO <sub>4</sub> +0.15 V <sub>f</sub> TiO <sub>2</sub>	975	Orthorhombic Pmnb Olivine type	11.7	49800		17	82
694	MgO-1.2Al <sub>2</sub> O <sub>3</sub> -2.8SiO <sub>2</sub> -0.6CeO <sub>2</sub>	1200	Composite	11.7	17300		48	320
695	(Mg <sub>4-x</sub> Co <sub>x</sub> )Nb <sub>2</sub> O <sub>9</sub> (x=0.5)	1200/10h	Corundum type Trigonal P-3c1	11.7	50700		-68	353
696	Sr <sub>2</sub> NaMg <sub>2</sub> V <sub>3</sub> O <sub>12</sub>	900/4h	Cubic garnet Ia-3d	11.7	37900		-3	354
697	BaSm <sub>2</sub> (MoO <sub>4</sub> )	960	Monoclinic	11.8	20000	9.7	-34	352
698	0.9Al <sub>2</sub> O <sub>3</sub> -0.1TiO <sub>2</sub> +0.3 wt% Nb <sub>2</sub> O <sub>5</sub>	1550	Composite	11.8	8000		2	355
699	0.94(0.79ZnAl <sub>2</sub> O <sub>4</sub> -0.21Mg <sub>2</sub> TiO <sub>4</sub> )-0.06CaTiO <sub>3</sub>	1400	Composite	11.8	88080		-8	288

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
700	La(Mg <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> +B <sub>2</sub> O <sub>3</sub> -La <sub>2</sub> O <sub>3</sub> -MgO	800	Composite	11.8	14700		7.4	356
701	ZnO-B <sub>2</sub> O <sub>3</sub> -P <sub>2</sub> O <sub>5</sub> -TeO <sub>2</sub> glass annealed			11.8	3500		-90	318
702	0.85CaWO <sub>4</sub> -0.15LaNbO <sub>4</sub> +3 wt% H <sub>3</sub> BO <sub>3</sub> -1 wt% Li <sub>2</sub> CO <sub>3</sub>	900	Scheelite+second phases	11.8	45200		-23	357
703	La(Mg <sub>0.5</sub> Ti <sub>0.5</sub> )O <sub>3</sub> +0.6B <sub>2</sub> O <sub>3</sub> -0.12La <sub>2</sub> O <sub>3</sub> - 0.28MgO	850/2h	Composite	11.8	14700		7	356
704	Y <sub>2</sub> BaCuO <sub>5</sub>	1250	Orthorhombic Pnma	11.8	3200	10.7	-38	244
705	Mg <sub>4</sub> NbTaO <sub>9</sub>	1100	Corundum type P-3c1	11.8	281670		-66	358
706	LaBO <sub>3</sub>	1300	Orthorhombic Pmcn	11.8	76900	15	-52	359
707	Mg <sub>4</sub> Nb <sub>1.5</sub> Ta <sub>5</sub> O <sub>9</sub>	1100	Corundum type Trigonal P-3c1	11.9	234520		-67	358
708	Li <sub>2</sub> MnO <sub>3</sub> +2 wt% BCB	1200/4h	Monoclinic C2/c	11.9	80600		0	360
709	BaO-SrO-SiO <sub>2</sub> -ZrO <sub>2</sub>	<1000	Composite	12.0	1000	5		361
710	CoCu <sub>2</sub> Nb <sub>2</sub> O <sub>8</sub> +3 wt% V <sub>2</sub> O <sub>5</sub>	885		12.0	7530		-18	315
711	CaO-4Co <sub>3</sub> O <sub>4</sub> -Nb <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1100	Mixture	12.0	28000	6.9	-42	230
712	Mg <sub>4</sub> (TaNb <sub>1-x</sub> V <sub>x</sub> )O <sub>9</sub> (x=0.025)	1200	Corundum type Trigonal P-3c1	12.0	200000		-73	362
713	Mg <sub>4</sub> Ta <sub>2</sub> O <sub>9</sub>	1250	Corundum type P-3c1	12.0	347000		-65	235
714	AlNbO <sub>4</sub>	1250	Monoclinic fergusonite C2/m	12.0	34000		-56	363
715	0.85CaWO <sub>4</sub> -0.5SmNbO <sub>4</sub> +1 wt% Li <sub>2</sub> WO <sub>4</sub>	800	Composite	12.0	13300		-28	364
716	Ba <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub> +60 wt% CaWO <sub>4</sub>	900	Composite	12.0	37000		-1	365
717	Ba <sub>3</sub> V <sub>4</sub> O <sub>13</sub>	700/4h	Monoclinic C2/c	12.0	22500		-67	366
718	Ca <sub>4</sub> Tb <sub>6</sub> (SiO <sub>4</sub> ) <sub>4</sub> (PO <sub>4</sub> ) <sub>2</sub> O <sub>2</sub>		Hexagonal Apatite P6 <sub>3</sub> /m	12.0	19000		-10	367
719	Mg <sub>3-x</sub> Ca <sub>x</sub> V <sub>2</sub> O <sub>8</sub> (x=9/4)	950		12.0	5700		15	368
720	Ca <sub>2</sub> V <sub>2</sub> O <sub>7</sub>	920	Anorthic Triclinic P-1	12.1	15400		-32	299
721	0.8CaMoO <sub>4</sub> -0.2TiO <sub>2</sub> +3 wt% H <sub>3</sub> BO <sub>3</sub> -CuO	875	Composite	12.1	53300		-16	309
722	0.662BaMoO <sub>4</sub> -0.338TiO <sub>2</sub>	1285	Composite	12.1	41600		-25	229
723	0.76SrMoO <sub>4</sub> -0.24TiO <sub>2</sub> +3 wt% H <sub>3</sub> BO <sub>3</sub> -CuO	900	Composite	12.1	40700		10	309
724	PbO:B <sub>2</sub> O <sub>3</sub> :SiO <sub>2</sub> (40:20:40) glass		Glass	12.1	1420	12.2	-31	92

725	MgWO <sub>4</sub>	1200	Wolframite Monoclinic P-2/c	12.1	41800		-45	48,49
726	Li <sub>0.8</sub> Mg <sub>4.1</sub> V <sub>3</sub> O <sub>12</sub>	760	Tetragonal	12.1	21800		2	248
727	5BaO-2V <sub>2</sub> O <sub>5</sub>	900/1h	Composite	12.1	26800		7	255
728	Ca(Mg <sub>0.92</sub> Al <sub>0.08</sub> )(Si <sub>0.96</sub> Al <sub>0.04</sub> ) <sub>2</sub> O <sub>6</sub> +22 wt% TiO <sub>2</sub>	1225	Mixture	12.1	6000		2	258
729	Y <sub>2</sub> BaCu <sub>0.75</sub> Zn <sub>0.25</sub> O <sub>5</sub>	1250	Orthorhombic Pnma	12.2	25660	11.5	-40	244
730	Dy <sub>3</sub> Ga <sub>5</sub> O <sub>12</sub>	1450	Cubic Garnet Ia3d	12.2	42100	14.6	-22	340,369
731	0.76SrMoO <sub>4</sub> -0.24TiO <sub>2</sub>	1300	Composite	12.2	21700		40	309
732	0.92MgAl <sub>2</sub> O <sub>4</sub> -0.08(Ca <sub>0.8</sub> Sr <sub>0.2</sub> )TiO <sub>3</sub>	1440/ 20 min	Composite	12.2	56200		-3	370
733	0.88Al <sub>2</sub> O <sub>3</sub> -0.12TiO <sub>2</sub> +2 wt% MCAS glass	1350	Composite	12.3	20485		2.5	348
734	BaCe <sub>2</sub> (MoO <sub>4</sub> ) <sub>4</sub>	840	Monoclinic	12.3	24700	7.5	-37	301,371
735	Mg <sub>4</sub> Nb <sub>2</sub> O <sub>9</sub> sol-gel	1250	Corundum type P-3c1	12.3	165000		-48	372
736	Ca <sub>2+x</sub> La <sub>8-x</sub> (SiO <sub>4</sub> ) <sub>6-x</sub> (PO <sub>4</sub> )O <sub>2</sub> (x=4)	1675/4h	Hexagonal P6 <sub>3</sub> /m apatite	12.3	15900		-28	349
737	Mg <sub>3</sub> CoNb <sub>2</sub> O <sub>9</sub>	1150	Corundum type P-3c1	12.3	34560		-64	358
738	Yb <sub>2</sub> BaZnO <sub>5</sub>		Orthorhombic Pnma	12.3	27000		-60	149
739	0.72Ba(Mg <sub>1/2</sub> W <sub>1/2</sub> )O <sub>3</sub> -0.28BaTiO <sub>3</sub>	1500/6h	Perovskite	12.3	11000		-5	373
740	Sm <sub>3</sub> Ga <sub>5</sub> O <sub>12</sub> +TiO <sub>2</sub>	1450	Garnet cubic Ia3d	12.3	234700	14.1	-16	369
741	Sm <sub>3</sub> Ga <sub>5</sub> O <sub>12</sub>	1450	Garnet cubic Ia3d	12.3	192200	14	-19	369
742	(Mg <sub>4-x</sub> Co <sub>x</sub> )Nb <sub>2</sub> O <sub>9</sub> (x=1)	1200/10h	Corundum type Trigonal P-3c1	12.3	34500		-64	358
743	Ba <sub>3</sub> V <sub>2</sub> O <sub>8</sub>	1300/1h	Hexagonal	12.3	52200		42	255
744	0.50Li <sub>2</sub> MoO <sub>4</sub> -0.5TiO <sub>2</sub>	720	Mixture	12.3	27000		23	283
745	CeVO <sub>4</sub>	950	Tetragonal zircon	12.3	41500		-35	374
746	Na <sub>2</sub> YMg <sub>2</sub> V <sub>3</sub> O <sub>12</sub>	850	Cubic garnet Ia-3d	12.3	23200	10.2	-4	375
747	Nd <sub>3</sub> Ga <sub>5</sub> O <sub>12</sub>	1400	Garnet Cubic Ia-3d	12.4	137800	13.8	-33	369
748	0.9Al <sub>2</sub> O <sub>3</sub> -0.1TiO <sub>2</sub> Annealed at 1000 C	1350	Composite	12.4	117000		1.5	376
749	Al <sub>2</sub> O <sub>3</sub> -TiO <sub>2</sub> :MnO	1300	Composite	12.4	274000	76	0	377
750	0.9Al <sub>2</sub> O <sub>3</sub> -0.1TiO <sub>2</sub>	1300/2h	Composite	12.4	148000		2	378
751	(1-x)LiYW <sub>2</sub> O <sub>8</sub> -xBaWO <sub>4</sub> +y wt% B <sub>2</sub> O <sub>3</sub> (x=0.2, y=0)	900	Mixed phases	12.4	12100		33	48
752	Ce <sub>2</sub> (WO <sub>4</sub> ) <sub>3</sub>	1000	Monoclinic C2/c	12.4	10500	4.8	-39	290

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
753	0.9LiCa <sub>3</sub> MgV <sub>3</sub> O <sub>12</sub> +0.1CaTiO <sub>3</sub>	925/4h	Cubic garnet Ia3d	12.4	57600		3	305
754	Mg <sub>4</sub> Nb <sub>2</sub> O <sub>9</sub>	1200/10h	Corundum type Trigonal P-3c1	12.4	192200		-71	358
755	Mg <sub>4</sub> NbSbO <sub>9</sub>	1500	Corundum type Trigonal P-3c1	12.5	275000		-45	379
756	0.895Al <sub>2</sub> O <sub>3</sub> -0.105TiO <sub>2</sub>	1350	Composite	12.5	340000	80	2	380
757	Eu <sub>3</sub> Ga <sub>5</sub> O <sub>12</sub>	1400	Garnet cubic Ia3d	12.5	169100	14.6	-17	369
758	LaBO <sub>3</sub>		Orthorhombic Pncn	12.5	53000			135
759	Ba <sub>3</sub> ZnNb <sub>2-x</sub> Sb <sub>x</sub> O <sub>9</sub> (x=1.875)		Perovskite Pm3m cubic	12.5	2290	7.6		381
760	Ba <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub> +0.5 wt% B <sub>2</sub> O <sub>3</sub>	950	Trigonal R-32m	12.5	41065		39	108
761	NaMg <sub>4</sub> V <sub>3</sub> O <sub>12</sub>	690	Tetragonal I-42d	12.5	35900	10.5	-58	382
762	Mg <sub>4</sub> Nb <sub>2</sub> O <sub>9</sub> +3 wt% LiF	950/10h	Corundum type Trigonal P-3c1	12.6	116410		-72	273
763	0.83ZnAl <sub>2</sub> O <sub>4</sub> -0.17TiO <sub>2</sub>	1410	Composite	12.6	100200	10	0	198,383
764	Yb <sub>2</sub> Ba(Cu <sub>0.25</sub> Ni <sub>0.75</sub> )O <sub>5</sub>		Orthorhombic Immm	12.6	50040		-41	149
765	YSmBaCuO <sub>5</sub>		Orthorhombic	12.6	25130	11	-30	384
766	Mg <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub> -0.5Ba <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub> +0.0625 wt% Li <sub>2</sub> CO <sub>3</sub>	950/5h	Composite	12.6	74400		-6	322
767	SrGd <sub>4</sub> Si <sub>3</sub> O <sub>13</sub>	1525/4h	Hexagonal apatite P6 <sub>3</sub> /m	12.6	8800		-20	253
768	1-x(0.79ZnAlO <sub>4</sub> -0.21Co <sub>2</sub> TiO <sub>4</sub> )-xCaTiO <sub>3</sub> (x=0.08)	1400	Composite	12.6	67500		-1	310
769	SrY <sub>4</sub> Si <sub>3</sub> O <sub>13</sub>	1575/4h	Hexagonal apatite P6 <sub>3</sub> /m	12.6	20500		-18	253
770	0.7LiZnVO <sub>4</sub> -0.3TiO <sub>2</sub>	680	Composite	12.6	38000		5	140
771	Li <sub>2</sub> Mg <sub>3</sub> ZrO <sub>6</sub>	1380	Cubic rocksalt Fm-3m	12.6	86000	9.3	-36	222
772	Mg <sub>4</sub> Nb <sub>2</sub> O <sub>9</sub> /MgO	1400	Composite	12.6	196700		-47	385
773	(La <sub>0.5</sub> Na <sub>0.5</sub> ) <sub>1-x</sub> -(Na <sub>0.5</sub> Nd <sub>0.5</sub> ) <sub>x</sub> WO <sub>4</sub> (x=0.3)	800/2h	Composite	12.7	23500		-1	386
774	0.9Al <sub>2</sub> O <sub>3</sub> -0.1TiO <sub>2</sub>	1300	Composite	12.7	176000		-14	387
775	YTmBaCuO <sub>5</sub>		Orthorhombic	12.7	17900	10.6	-27	384
776	PbO:B <sub>2</sub> O <sub>3</sub> :SiO <sub>2</sub> (40:40:20) glass		Glass	12.7	1700	12	-69	92
777	[(Li <sub>0.5</sub> Bi <sub>0.5</sub> ) <sub>0.1-x</sub> Ca <sub>0.9</sub> ]MoO <sub>4</sub>	850	Scheelite Tetragonal I4 <sub>1</sub> /a	12.7	41300	10	-17	388
778	(Mg <sub>0.95</sub> Zn <sub>0.05</sub> ) <sub>4</sub> Ta <sub>2</sub> O <sub>5</sub>			12.7	385000		-62	389
779	Tm <sub>2</sub> BaCuO <sub>5</sub>	1250	Orthorhombic Pmna	12.8	14400	9.77	-15	384
780	NiCu <sub>2</sub> Nb <sub>2</sub> O <sub>8</sub>	985		12.8	4240		481	315

781	SrTm <sub>4</sub> Si <sub>3</sub> O <sub>13</sub> +0.5 wt% LBS glass	1575/4h	Apatite monoclinic P2 <sub>1</sub> /m	12.8	16500		-26	253
782	0.8CaMoO <sub>4</sub> -0.2TiO <sub>2</sub>	1325	Composite	12.8	29310		10	309
783	Li <sub>2</sub> SnO <sub>3</sub>	1230	Monoclinic C2/c	12.8	20800		27	390
784	(Mg <sub>4-x</sub> Co <sub>x</sub> )Nb <sub>2</sub> O <sub>9</sub> (x=1.5)	1200/10h	Corundum type Trigonal P-3c1	12.8	20500		-63	358
785	LiEr <sub>9</sub> (SiO <sub>4</sub> ) <sub>6</sub> O <sub>2</sub>	1250/4h	Apatite, Hexagonal P6 <sub>3</sub> /m	12.8	1300		17	391
786	SrYb <sub>4</sub> Si <sub>3</sub> O <sub>13</sub> +0.5 wt% LBS glass	1425/4h	Hexagonal apatite P6 <sub>3</sub> /m	12.9	12000		-27	253
787	BaTa <sub>2</sub> P <sub>2</sub> O <sub>11</sub>	1200	Rhombohedral R-3c	12.9	28900		-29	392
788	Y <sub>2</sub> Ba <sub>0.7</sub> Sr <sub>0.3</sub> CuO <sub>5</sub>		Orthorhombic Pnma	12.9	2960	10.7	2	393
789	0.89Al <sub>2</sub> O <sub>3</sub> -0.11TiO <sub>2</sub> -0.5 wt% ZnO	1350	Composite	12.9	187000		-2	394
790	Mg <sub>4</sub> Nb <sub>2</sub> O <sub>9</sub>	1300/10h	Trigonal P-3c1	12.9	217390	-	-70	346,358
791	Na <sub>2</sub> Mo <sub>2</sub> O <sub>7</sub>	575	Orthorhombic Cmca	12.9	62400		-72	11
792	Mg <sub>3</sub> La <sub>4</sub> Al <sub>44</sub> O <sub>75</sub>	1680	Magnetoplumbite	13.0	7700		3	145
793	2CaO-3ZnO-Ta <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1300	Composite	13.0	20000	6.6	-24	230
794	Ba <sub>3</sub> ZnNb <sub>2-x</sub> Sb <sub>x</sub> O <sub>9</sub> (x=2)		Perovskite	13.0	1550	7.7		381
795	Ba <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub>	1200	Rhombohedral R3 <sub>2</sub> /m	13.0	46700		17	322
796	Mg <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub> -0.5Ba <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub> +0.0625 wt% Li <sub>2</sub> CO <sub>3</sub>	950/5h	Composite	13.0	74000		-6	322
797	SrDy <sub>4</sub> Si <sub>3</sub> O <sub>13</sub> +0.5 wt% LBS glass	1425/4h	Hexagonal apatite P6 <sub>3</sub> /m	13.0	9500		28	253
798	Mg <sub>4</sub> NbSbO <sub>9</sub>	1500	Corundum type Trigonal P-3c1	13.0	275000			395
799	(Mg <sub>0.95</sub> Zn <sub>0.05</sub> ) <sub>4</sub> Nb <sub>2</sub> O <sub>9</sub>	1340/4h	Corundum Trigonal P-3c1	13.0	247000		-67	396
800	0.77CaMoO <sub>4</sub> -0.23TiO <sub>2</sub> +3 wt% H <sub>3</sub> BO <sub>3</sub> -CuO	900	Composite	13.0	57400		-5	309
801	Li <sub>3</sub> (Mg <sub>0.95</sub> Mn <sub>0.05</sub> ) <sub>2</sub> NbO <sub>6</sub>	1140/4h	Fdd	15.6	52200	8.9	-20	397
802	(Mg <sub>0.95</sub> Zn <sub>0.05</sub> ) <sub>2</sub> (Ti <sub>0.8</sub> Sn <sub>0.2</sub> )O <sub>4</sub>	1150/5h	Spinel Cubic Fd3m	13.1	119310	10	-59	398
803	SrYb <sub>4</sub> Si <sub>3</sub> O <sub>13</sub>	1525/4h	Hexagonal apatite P6 <sub>3</sub> /m	13.1	11400		-25	253
804	Sr <sub>2</sub> ZnTeO <sub>6</sub> +2 wt% ZnO-B <sub>2</sub> O <sub>3</sub> -P <sub>2</sub> O <sub>5</sub> -TeO <sub>2</sub> glass	950	Composite	13.1	4300		-53	318
805	0.67Ba(Mg <sub>1/2</sub> W <sub>1/2</sub> )O <sub>3</sub> -0.33BaTiO <sub>3</sub>	1500/6h	Perovskite	13.1	35000		-6	373
806	MgWO <sub>4</sub>	1150	Wolframite Monoclinic P12/c1	13.1	69000		-58	150
807	MgWO <sub>4</sub> +9 wt% Li <sub>2</sub> CO <sub>3</sub>	950	Composite	13.1	20000		-75	399
808	Ba <sub>2</sub> SiO <sub>4</sub>	1525	Orthorhombic Pmcn	13.1	17900		-17	210

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
809	Al <sub>2</sub> O <sub>3</sub> -WO <sub>3</sub> -TiO <sub>2</sub>	1150	Multiphase	13.2	3580	6.9	12	400
810	Mg <sub>2</sub> Co <sub>2</sub> Nb <sub>2</sub> O <sub>9</sub>		Corundum type Trigonal P-3c1	13.2	14300		-51	358
811	CeO <sub>2</sub> +20 wt% B <sub>2</sub> O <sub>3</sub>	900	Cubic fluorite Fm3m	13.2	24200	4.3	-46	401
812	(Mg <sub>0.95</sub> Ca <sub>0.05</sub> )TiO <sub>3</sub> +BaO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> (50:50 wt%)	900	Composite	13.2	10000		-	402
813	Ca <sub>2</sub> MgTeO <sub>6</sub> +0.2 wt% B <sub>2</sub> O <sub>3</sub>	1250	Perovskite	13.2	81000	5.5	-81	324
814	LiGd <sub>9</sub> (SiO <sub>4</sub> ) <sub>6</sub> O <sub>2</sub>	1250/4h	Apatite, Hexagonal P63/m	13.2	6900		23	391
815	Ba <sub>2</sub> Ti <sub>9</sub> O <sub>20</sub> +50 vol% BBS glass	900	Composite	13.2	1150			338
816	LiCa <sub>3</sub> ZnV <sub>3</sub> O <sub>12</sub> -0.2CaTiO <sub>3</sub>	925	Cubic Garnet	13.2	59600	1		341
817	0.5MgAl <sub>2</sub> O <sub>4</sub> -0.5TiO <sub>2</sub>	1460	Composite	13.2	88000	6.8	-4	195
818	Ni <sub>1-x</sub> (Zn <sub>1/2</sub> Zr <sub>1/2</sub> ) <sub>x</sub> W <sub>1-x</sub> Nb <sub>x</sub> O <sub>4</sub> (x=0.25)		Monoclinic Wolframite P2/c	13.2	28700		-29	403
819	YErBaCuO <sub>5</sub>		Orthorhombic	13.3	16050	10.6	-34	384
820	NiWO <sub>4</sub>	1200	Wolframite Monoclinic P2/c	13.3	24900			264
821	0.7CaWO <sub>4</sub> -0.3LaNbO <sub>4</sub>	1150	Composite	13.3	50000		-9	279
822	(Na <sub>0.5</sub> Bi <sub>0.5</sub> ) <sub>0.2</sub> Ca <sub>0.8</sub> MoO <sub>4</sub>	850	Scheelite Tetragonal	13.3	32900		-42	343
823	0.8Mg <sub>1.9</sub> Cu <sub>0.1</sub> SiO <sub>4</sub> -0.2(La <sub>0.5</sub> Na <sub>0.5</sub> )TiO <sub>3</sub> +4 wt% LiF	950	Orthorhombic	13.3	14400		6	404
824	Sm <sub>2</sub> BaCu <sub>0.5</sub> Zn <sub>0.5</sub> O <sub>5</sub>	1280	Orthorhombic Pnma	13.4	65740	10.6	-6	405
825	Sr <sub>2</sub> ZnTeO <sub>6</sub> +5 wt% ZnO-B <sub>2</sub> O <sub>3</sub> -P <sub>2</sub> O <sub>5</sub> -TeO <sub>2</sub> glass	950	Composite	13.4	4500		-52	318
826	BaTa <sub>2</sub> P <sub>2</sub> O <sub>11</sub> +5 wt% TiO <sub>2</sub>	1250	Rhombohedral R-3c	13.4	17200		-6	392
827	0.47Mg <sub>4</sub> Nb <sub>2</sub> O <sub>9</sub> -0.53(0.5ZnAl <sub>2</sub> O <sub>4</sub> -0.5TiO <sub>2</sub> )	1390/4h	Composite	13.4	210000		-2	406
828	0.77CaMoO <sub>4</sub> -0.23TiO <sub>2</sub>	1325	Composite	13.4	31300		33	309
829	Sr <sub>2</sub> ZnTeO <sub>6</sub> +5 wt% ZnO-B <sub>2</sub> O <sub>3</sub> -P <sub>2</sub> O <sub>5</sub> -TeO <sub>2</sub> glass	950	Composite	13.4	4500		-2	318
830	Mg <sub>5</sub> Nb <sub>4</sub> O <sub>15</sub> +5 wt% B <sub>2</sub> O <sub>3</sub>	1300/4h	Multiphase	13.4	55700		-55	319
831	Er <sub>2</sub> BaCuO <sub>5</sub>		Orthorhombic Pnma	13.5	12560	11	-26	384
832	0.64Ba(Mg <sub>1/2</sub> W <sub>1/2</sub> )O <sub>3</sub> -0.36BaTiO <sub>3</sub>	1500/6h	Perovskite	13.5	14000		-6	373,407

833	ZnWO <sub>4</sub>	1200	Wolframite Monoclinic P2/c	13.5	62800		264
834	SrSm <sub>4</sub> Si <sub>3</sub> O <sub>13</sub>	1375/4h	Hexagonal apatite P6 <sub>3</sub> /m	13.5	20800	-28	253
835	Mg <sub>4</sub> Nb <sub>2</sub> O <sub>9</sub> +0.75 wt% Fe <sub>2</sub> O <sub>3</sub>	1240	Corundum type Trigonal P-3c1	13.5	280000	-62	408
836	Li <sub>2</sub> SnO <sub>3</sub>		Monoclinic C2/c	13.5	61600	29	409
837	SrY <sub>4</sub> Si <sub>3</sub> O <sub>13</sub> +0.5 wt% LBS glass	1475/4h	Hexagonal apatite P6 <sub>3</sub> /m	13.5	21500	-18	253
838	ZnW <sub>1-x</sub> Te <sub>x</sub> O <sub>4</sub> (x=0.05)	900	Wolframite P2 <sub>1</sub> /n	13.5	22500	-66	206
839	MgWO <sub>4</sub>	1050	Monoclinic P2/c	13.5	69000	-58	150
840	Li <sub>8</sub> Bi <sub>2</sub> Mo <sub>7</sub> O <sub>28</sub>	540	Tetragonal	13.6	8000	9.2 -59	30
841	Te <sub>2</sub> MoO <sub>7</sub>	520	Monoclinic P2 <sub>1</sub> /c	13.6	46900	-36	410
842	Ba <sub>3</sub> TiV <sub>4</sub> O <sub>15</sub>	800	Orthorhombic Pnma	13.6	31800	8.6 10	291
843	Li <sub>2</sub> MnO <sub>3</sub>	930/4h	Monoclinic C2/c	13.6	97000	-5	360
844	BaY <sub>2</sub> (MoO <sub>4</sub> ) <sub>4</sub> -0.5TiO <sub>2</sub>	970/2h	Composite	13.6	30800	9.6 1	411
845	Ce <sub>2</sub> (WO <sub>4</sub> ) <sub>3</sub> +0.2 wt% ZBS	900	Monoclinic C2/c	13.7	20200	-25	290
846	Li <sub>2</sub> SnO <sub>3</sub> +1 wt% BaO-CuO	900	Monoclinic C2/c	13.7	36400	27	390
847	Ca <sub>2+x</sub> La <sub>8-x</sub> (SiO <sub>4</sub> ) <sub>6-x</sub> (PO <sub>4</sub> )O <sub>2</sub> (x=0)	1475/4h	Hexagonal P6 <sub>3</sub> /m apatite	13.7	33100	-29	349
848	ZnMnW <sub>2</sub> O <sub>8</sub>	950		13.7	10670	-17	48
849	PbO:B <sub>2</sub> O <sub>3</sub> :SiO <sub>2</sub> (50:40:10) glass	409 Td	Glass	13.8	880	10.7 -98	92
850	Y <sub>2</sub> BaCu <sub>0.2</sub> Ni <sub>0.8</sub> O <sub>5</sub>	1390/3h	Orthorhombic Pnma	13.8	87200	12.8 -17	259
851	Ba <sub>2</sub> CeV <sub>3</sub> O <sub>11</sub>	1025		13.8	10000	-14	366
852	Ca <sub>2+x</sub> La <sub>6</sub> (SiO <sub>4</sub> ) <sub>4</sub> (PO <sub>4</sub> )O <sub>2</sub> (x=2)	1475/4h	Hexagonal P6 <sub>3</sub> /m apatite	13.8	27900	-11	349
853	Ca <sub>4</sub> La <sub>4</sub> Pr <sub>2</sub> (SiO <sub>4</sub> ) <sub>4</sub> (PO <sub>4</sub> ) <sub>2</sub> O <sub>2</sub>	1475	Hexagonal apatite P6 <sub>3</sub> /m	13.8	26000	-7	367
854	Ca <sub>4</sub> La <sub>2</sub> Pr <sub>4</sub> (SiO <sub>4</sub> ) <sub>4</sub> (PO <sub>4</sub> ) <sub>2</sub> O <sub>2</sub>	1475	Hexagonal apatite P6 <sub>3</sub> /m	13.8	21800	-5	367
855	0.6BaMoO <sub>4</sub> -0.4TiO <sub>2</sub>	1285	Composite	13.8	40500	-6	229
856	Nd <sub>2</sub> MoO <sub>6</sub>	1350/4h	Tetragonal I-42m	13.8	66400	-53	412
857	Te <sub>2</sub> (Mo <sub>0.95</sub> W <sub>0.05</sub> )O <sub>7</sub>	520	Monoclinic P2 <sub>1</sub> /c	13.9	25800	-13	410
858	Sr <sub>2</sub> ZnTeO <sub>6</sub> +10 wt% ZnO-B <sub>2</sub> O <sub>3</sub> -P <sub>2</sub> O <sub>5</sub> -TeO <sub>2</sub>	900	Composite	13.9	3300	-58	318
859	SrNdSi <sub>3</sub> O <sub>13</sub> +0.5 wt% LBS glass	1350/4h	Hexagonal apatite P6 <sub>3</sub> /m	13.9	20500	-33	253
860	SrSm <sub>4</sub> Si <sub>3</sub> O <sub>13</sub> +0.5 wt% LBS glass	1350/4h	Hexagonal apatite P6 <sub>3</sub> /m	13.9	21800	-28	253
861	1-xCeO <sub>2</sub> -xY <sub>2</sub> O <sub>3</sub> (x=0.5)	1650	Cubic fluorite Fm3m	13.9	35000	-53	413
862	YHoBaCuO <sub>5</sub>		Orthorhombic	13.9	12056	10.7 -30	384

(continued)



No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
863	Mg <sub>4</sub> Ta <sub>2</sub> O <sub>9</sub>	1200	Corundum type P-3c1	14.0	350000	–	–60	339
864	YDyBaCuO <sub>5</sub>		Orthorhombic	14.0	42600	10.8	–22	384
865	LaMgAl <sub>11</sub> O <sub>19</sub>	1700	Hexagonal P63/mmc	14.0	28000	7	–12	414
866	Y <sub>2</sub> BaCu <sub>0.75</sub> Zn <sub>0.25</sub> O <sub>5</sub>	1270	Orthorhombic Pnma	14.0	56230	10.8	–39	244
867	Mg <sub>5</sub> Nb <sub>4</sub> O <sub>15</sub>	1475	Psuedobrookite Orthorhombic Cmcm	14.0	14600	7.3	–58	325
868	5Co <sub>3</sub> O <sub>4</sub> -Ta <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1150	Mixture	14.0	48000	6.5	–43	230
869	0.2ZnAl <sub>2</sub> O <sub>4</sub> -0.8Co <sub>2</sub> TiO <sub>4</sub>		Not available	14.0	148800		–52	239
870	Mg <sub>3</sub> Ce <sub>4</sub> Al <sub>44</sub> O <sub>75</sub>	1680	Magnetoplumbite	14.0	9000		11	145
871	Ba <sub>3</sub> NiSb <sub>2</sub> O <sub>9</sub>		Perovskite	14.0	41840	7.8	–5	381
872	YGdBaCuO <sub>5</sub>		Orthorhombic	14.0	14300	10.9	–35	384
873	0.80ZnAl <sub>2</sub> O <sub>4</sub> -0.20TiO <sub>2</sub>	1420	Spinal cubic Fd3m composite	14.0	90700	9.66	6	198
874	Ba[Ti <sub>0.39</sub> (Co <sub>0.5</sub> W <sub>0.5</sub> ) <sub>0.61</sub> ]O <sub>3</sub>	1400	Perovskite	14.0	7700		–14	415
875	Li <sub>3</sub> (Mg <sub>0.92</sub> Zn <sub>0.08</sub> ) <sub>2</sub> NbO <sub>6</sub> +0.5 wt% 0.17Li <sub>2</sub> O-0.83V <sub>2</sub> O <sub>5</sub>	925/2h	Orthorhombic Fddd	14.0	83400		–37	416
876	0.662BaMoO <sub>4</sub> -0.338TiO <sub>2</sub> +5 wt% H <sub>3</sub> BO <sub>3</sub> +1 wt% CuO	875	Composite	14.0	48300		14	229
877	Li <sub>2</sub> ZrO <sub>3</sub>	1200	Tetragonal	14.1	17600		39	390
878	Li <sub>3</sub> TaO <sub>4</sub> +1 wt% B <sub>2</sub> O <sub>3</sub>	930	Rock salt type	14.1	29900	12.4	–48	294
879	LiEu <sub>9</sub> (SiO <sub>4</sub> ) <sub>6</sub> O <sub>2</sub>	1250/4h	Apatite, Hexagonal P6 <sub>3</sub> /m	14.1	7100		8	391
880	[(Li <sub>0.5</sub> Bi <sub>0.5</sub> ) <sub>0.15</sub> Ca <sub>0.85</sub> ]MoO <sub>4</sub>	760	Scheelite tetragonal I4 <sub>1</sub> /a	14.1	24000	10.3	11	388
881	Yb <sub>2</sub> Ba(Cu <sub>0.5</sub> Zn <sub>0.5</sub> )O <sub>5</sub>			14.2	20630		–48	149
882	Y <sub>2</sub> BaCu <sub>0.5</sub> Zn <sub>0.5</sub> O <sub>5</sub>	1270	Orthorhombic Pnma	14.2	110660	10.7	–42	244
883	Mg <sub>2</sub> TiO <sub>4</sub>	1500	Cubic spinel Fd3m	14.2	160000		–50	417,418
884	0.8(Al <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>2</sub> -0.2(Mg <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>2</sub>	1450	Composite	14.2	62150		–41	214
885	80 wt% (La <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub> -TiO <sub>2</sub> in 20:60: 20 mol%)+20 wt % BaNd <sub>2</sub> Ti <sub>5</sub> O <sub>14</sub>	850	Composite	14.2	9800	7.5	94	419
886	SrLa <sub>4</sub> Si <sub>3</sub> O <sub>13</sub>	1325/4h	Hexagonal apatite P6 <sub>3</sub> /m	14.2	26300		–46	253
887	SrEu <sub>4</sub> Si <sub>3</sub> O <sub>13</sub> +0.5 wt% LBS glass	1425/4h	Hexagonal apatite P6 <sub>3</sub> /m	14.2	19800		–22	253
888	LiLa <sub>9</sub> (SiO <sub>4</sub> ) <sub>6</sub> O <sub>2</sub>	1250/4h	Apatite, hexagonal P6 <sub>3</sub> /m	14.2	7300		18	391

889	LiSm <sub>9</sub> (SiO <sub>4</sub> ) <sub>6</sub> O <sub>2</sub>	1250/4h	Apatite, Hexagonal P6 <sub>3</sub> /m	14.2	8500		2	391
890	LiNd <sub>9</sub> (SiO <sub>4</sub> ) <sub>6</sub> O <sub>2</sub>	1250/4h	Apatite, Hexagonal P6 <sub>3</sub> /m	14.2	6400		12	391
891	Ba <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub>	925	Trigonal R-3 <sub>2</sub> /m	14.2	42200		52	330
892	Ba <sub>2</sub> BiV <sub>3</sub> O <sub>11</sub>	870	Monoclinic P2 <sub>1</sub> /c	14.2	68700	8.7	-81	420
893	LaVO <sub>4</sub>	850	Monoclinic Monazite	14.2	48200		-38	374
894	SrTb <sub>4</sub> Si <sub>3</sub> O <sub>13</sub> +0.5 wt% LBS glass	1425/4h	Hexagonal apatite P6 <sub>3</sub> /m	14.3	23500		10	253
895	0.2ZnAl <sub>2</sub> O <sub>4</sub> -0.8Co <sub>2</sub> TiO <sub>4</sub>		Composite	14.3	148000		-53	239
896	SrTb <sub>4</sub> Si <sub>3</sub> O <sub>13</sub>	1500/4h	Hexagonal apatite P6 <sub>3</sub> /m	14.3	19300		6	253
897	LiY(W <sub>1-x</sub> Te <sub>x</sub> ) <sub>2</sub> O <sub>8</sub> (x=0.2)	850	Monoclinic	14.3	4000		-6	421
898	Mg <sub>0.95</sub> Co <sub>0.05</sub> TiO <sub>3</sub>	1275/4h	Ilmenite Trigonal R-3	14.3	128000	7	-51	422
899	Sr <sub>2</sub> MgTeO <sub>6</sub> +0.2 wt% B <sub>2</sub> O <sub>3</sub>	1250	Cubic Fm3m	14.3	27400	5.5	-60	324
900	BaO-0.35MgO-0.33WO <sub>3</sub> -0.32TiO <sub>2</sub>	1500/6h	Perovskite Hexagonal	14.4	74000		-9	373
901	BaO+0.34MgO-0.32WO <sub>3</sub> -0.34TiO <sub>2</sub>	1500/6h	Perovskite Hexagonal	14.4	87000		-7	373
902	Sm <sub>2</sub> BaCu <sub>0.75</sub> Zn <sub>0.25</sub> O <sub>5</sub>	1280	Orthorhombic Pnma	14.4	47000	10.6	-7	405
903	La <sub>2</sub> Sn <sub>2</sub> O <sub>7</sub>	1580/34h	Cubic Fd3m	14.4	40500		-54	423
904	Ca <sub>1-x</sub> (La <sub>0.5</sub> Na <sub>0.5</sub> ) <sub>x</sub> WO <sub>4</sub> +30 mol%TiO <sub>2</sub> (x=0.9)	850/2h	Composite	14.4	14300		-9	424
905	80 wt% (La <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub> -TiO <sub>2</sub> in 20:60:20 mol%)+20 wt % BaNd <sub>2</sub> Ti <sub>5</sub> O <sub>14</sub>	800	Composite	14.5	9100	7.5	86	419
906	BaO-0.34MgO-0.32WO <sub>3</sub> -0.34TiO <sub>2</sub>	1500/12h	Perovskite Hexagonal	14.5	107000		-8	373,407
907	Mg <sub>3</sub> Pr <sub>4</sub> Al <sub>44</sub> O <sub>75</sub>	1680	Magnetoplumbite	14.5	10000		23	145
908	Y <sub>2</sub> BaCu <sub>0.6</sub> Ni <sub>0.4</sub> O <sub>5</sub>	1340	Orthorhombic Pnma	14.5	36000	14.5	26	259
909	MnWO <sub>4</sub>	1000	Monoclinic P2/c	14.5	32000		-64	150
910	Ba <sub>2</sub> SiO <sub>4</sub>	1525/4h	Orthorhombic Pmcn	14.5	17900		-17	210
911	Ca <sub>4</sub> La <sub>6</sub> (SiO <sub>4</sub> ) <sub>4</sub> (VO <sub>4</sub> ) <sub>2</sub> O <sub>2</sub>	1475	Hexagonal apatite P6 <sub>3</sub> /m	14.5	22000		-20	367
912	Mg <sub>2</sub> TiO <sub>4</sub> +1.5 wt% CeO <sub>2</sub> nano particles		Spinel Fd3m	14.6	167000			425
913	(Mg <sub>0.97</sub> Zn <sub>0.03</sub> )(Ti <sub>0.95</sub> Sn <sub>0.05</sub> )O <sub>4</sub>	1390/4h	Cubic spinel	14.6	183500		-44	426
914	Ba <sub>3</sub> MgNb <sub>2-x</sub> Sb <sub>x</sub> O <sub>9</sub> (x=0.5)		Perovskite	14.7	81300	6.3	5	381
915	Zn <sub>3</sub> Nb <sub>2</sub> O <sub>8</sub> +3 wt% (0.29BaCO <sub>3</sub> +0.71CuO)	950	Monoclinic C2/c	14.7	8200	8.3		427
916	SrLa <sub>4</sub> Si <sub>3</sub> O <sub>13</sub> +0.5 wt% LBS glass	1300/4h	Hexagonal apatite P6 <sub>3</sub> /m	14.7	25800		-40	253

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
917	Cu <sub>2</sub> ZnNb <sub>2</sub> O <sub>8</sub> +1 wt% LBS glass	935	Triclinic	14.7	5100		-18	428
918	Cu <sub>2</sub> ZnNb <sub>2</sub> O <sub>8</sub> +0.7 wt% LMZBS glass	935	Triclinic	14.8	2500		-39	428
919	SrEu <sub>4</sub> Si <sub>3</sub> O <sub>13</sub>	1450/4h	Hexagonal apatite P6 <sub>3</sub> /m	14.8	20700		-24	253
920	LiYW <sub>2</sub> O <sub>8</sub>	900	Monoclinic	14.8	9550		-64	48
921	0.2(Li <sub>1/2</sub> Nd <sub>1/2</sub> )WO <sub>4</sub> -0.8ZnWO <sub>4</sub>	850/4h	Tetragonal I4 <sub>1</sub> /n	14.8	1370		-20	429
922	Li <sub>2</sub> Zn <sub>2</sub> W <sub>2</sub> O <sub>9</sub>	790	Corundum	14.7	15700	9.7	-77	430
923	Ni <sub>1-x</sub> (Zn <sub>1/2</sub> Zr <sub>1/2</sub> ) <sub>x</sub> W <sub>1-x</sub> Nb <sub>x</sub> O <sub>4</sub> (x=0.5)		Monoclinic wolframite P2/c	14.8	32650		-35	403
924	Ba <sub>3</sub> NiNb <sub>2-x</sub> Sb <sub>x</sub> O <sub>9</sub> (x=1.875)		Perovskite	14.8	38380	6.8	-10	381
925	Yb <sub>2</sub> Ba(Cu <sub>0.25</sub> Zn <sub>0.75</sub> )O <sub>5</sub>			14.9	52810		-45	149
926	Dy <sub>2</sub> BaCuO <sub>5</sub>		Orthorhombic Pnma	14.9	31610	10.56	-6	384
927	1-xCeO <sub>2</sub> -xGd <sub>2</sub> O <sub>3</sub> (x=0.5)	1650	Cubic fluorite Fm3m	14.9	15300		-62	413
928	0.1ZnAl <sub>2</sub> O <sub>4</sub> -0.9Co <sub>2</sub> TiO <sub>4</sub>		Composite	14.9	130000		-50	239
929	Ba <sub>2</sub> CeV <sub>3</sub> O <sub>11</sub>	1025		14.9	12700	5	-15	366
930	Bi <sub>4</sub> (SiO <sub>4</sub> ) <sub>3</sub>	900	Cubic I-43d	14.9	36000		-9	431
931	ZnW <sub>1-x</sub> Te <sub>x</sub> O <sub>4</sub> (x=0.1)	900	Wolframite P2 <sub>1</sub> /n	14.9	27700		-65	206
932	0.8ZnAl <sub>2</sub> O <sub>4</sub> -0.2Co <sub>2</sub> TiO <sub>4</sub>		Composite	15.0	148000		-50	239
933	Sr <sub>2</sub> TiO <sub>4</sub>	1300/5h	Tetragonal I4/mmm	15.0	1600	4		53
934	5MgO-Nb <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1325	Mixture	15.0	59000	6.8	-77	230
935	Mg <sub>3</sub> Nd <sub>4</sub> Al <sub>44</sub> O <sub>75</sub>	1680	Magnetoplumbite	15.0	11000		35	145
936	Ba <sub>3</sub> MgNb <sub>2-x</sub> Sb <sub>x</sub> O <sub>9</sub> (x=1.875)		Perovskite	15.0	84100	7.25	2.8	381
937	Ba(Mg <sub>1/2</sub> W <sub>1/2</sub> )O <sub>3</sub>	1550	Perovskite cubic Fm3m	15.0	57300	12.7		432
938	BiZn <sub>2</sub> VO <sub>6</sub>	780/4h	Triclinic P-1	15.0	20650		-88	433
939	BaO-0.34MgO-0.33WO <sub>3</sub> -0.33TiO <sub>2</sub>	1500/6h	Perovskite hexagonal	15.1	72000		-13	373
940	Al <sub>2</sub> O <sub>3</sub> +Ca-Al-B-Si-O+Ba-(Sm,Nd)-Ti-O	870	Composite	15.1	2800	3		215
941	Ba <sub>2</sub> CeV <sub>3</sub> O <sub>11</sub> +1 wt% ZnO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub>	825		15.1	20300	4.9	-21	366
942	CeTe <sub>2</sub> O <sub>6</sub>	680	Monoclinic P2 <sub>1</sub> /n	15.2	45400		-68	434
943	Y <sub>2</sub> BaCu <sub>0.25</sub> Zn <sub>0.75</sub> O <sub>5</sub>	1270	Orthorhombic Pnma	15.2	70080	9.95	-42	244
944	(Mg <sub>4-x</sub> Co <sub>x</sub> )Nb <sub>2</sub> O <sub>9</sub> (x=3)	1200/10h	Corundum type Trigonal P-3c1	15.2	2200		-36	358
945	Ca <sub>4</sub> La <sub>6</sub> (GeO <sub>4</sub> ) <sub>4</sub> (PO <sub>4</sub> ) <sub>2</sub> O <sub>2</sub>	1475	Hexagonal apatite P6 <sub>3</sub> /m	15.2	20400		-11	367
946	Ni <sub>1-x</sub> (Zn <sub>1/2</sub> Zr <sub>1/2</sub> ) <sub>x</sub> W <sub>1-x</sub> Nb <sub>x</sub> O <sub>4</sub> (x=0.75)		Monoclinic Wolframite P2/c	15.2	41250		-45	403

947	$\text{Li}_3(\text{Mg}_{0.95}\text{Ni}_{0.05})_2\text{NbO}_6$	1140/4H	Fdd	15.2	84800	8.9	-23	397
948	$\text{Li}_2\text{Mg}_3\text{TiO}_6$	1280	Cubic rocksalt Fm-3m	15.2	152000	8.3	-39	222
949	$\text{Ho}_2\text{BaCuO}_5$		Orthorhombic Pbnm	15.3	9360	10.48	-19	384
950	$\text{LaSrAlO}_4$	1375	Tetragonal I4/mmm	15.3	32820		-17	435
951	$\text{PbO}:\text{B}_2\text{O}_3:\text{SiO}_2$ (60:20:20) glass	348 Td	Glass	15.3	650	11.72	-124	92
952	$\text{LiPr}_9(\text{SiO}_4)_6\text{O}_2$	1250/4h	Apatite, hexagonal P6 <sub>3</sub> /m	15.3	6400		33	391
953	$\text{Ca}_3\text{WO}_6$	1275	Monoclinic P2 <sub>1</sub> /n	15.3	29200		-30	436
954	$\text{ZnW}_{1-x}\text{Te}_x\text{O}_4$ (x=0.15)	900	Wolframite Monoclinic P2 <sub>1</sub> /n	15.3	41700		-61	206
955	$0.8(\text{Mg}_{0.95}\text{Co}_{0.05})_4\text{Ta}_2\text{O}_9-0.2\text{CaTiO}_3$	1375/4h	composite	15.3	390500		-35	437
956	$\text{Y}_2\text{BaZnO}_5$	1270	Orthorhombic Pnma	15.4	189000	10	-41	244
957	$\text{Y}_2\text{Ba}(\text{Cu}_{1/4}\text{Zn}_{3/4})\text{O}_5$		Orthorhombic Pbnm	15.4	220000		-65	235
958	$\text{BaO}-0.35\text{MgO}-0.34\text{WO}_3-0.31\text{TiO}_2$	1500/6h	Perovskite hexagonal	15.4	77000		-8	373
959	$\text{Ba}(\text{Mg}_{1/3}\text{Ta}_{(2-2x)/3}\text{W}_{x/3}\text{Ti}_{1/3})\text{O}_3$ (x=1)	1550/4h	Perovskite Trigonal P-3m1	15.4	35400		-25	438
960	$0.8\text{MgTiO}_3-0.2\text{Mg}_{2.05}\text{SiO}_{4.05}-0.06\text{CaTiO}_3$	1380/4h	Composite	15.4	72700		-1	439
961	$\text{Li}_3(\text{Mg}_{0.95}\text{Zn}_{0.05})_2\text{NbO}_6$	1140/4H	Fdd	15.4	82200	8.9	-19	397
962	$\text{Sm}_2\text{Ba}(\text{Cu}_{0.985}\text{Co}_{0.015})\text{O}_5$		Orthorhombic Pnma	15.5	59300	10.3	-8	323
963	$\text{SrSmAlO}_4$		K <sub>2</sub> NiF <sub>4</sub> type tetragonal I4/mmm	15.5	95300		-1	440
964	$0.91\text{MgWO}_4-0.09\text{CaTiO}_3+5 \text{ wt}\% \text{Li}_2\text{CO}_3-4\text{H}_3\text{BO}_3$	950		15.5	20800		0	441
965	$(\text{Mg}_{0.95}\text{Zn}_{0.05})_2\text{TiO}_4$	1330	Cubic Fd3m	15.5	275300		-34	442
966	$(\text{Mg}_{0.9}\text{Mn}_{0.1})_2\text{TiO}_4$	1330	Cubic Fd3m	15.5	172000		-57	443
967	$\text{SrNd}_4\text{Si}_3\text{O}_{13}$	1400/4h	Hexagonal apatite P6 <sub>3</sub> /m	15.5	21000		-29	253
968	$\text{ZnW}_{1-x}\text{Te}_x\text{O}_4$ (x=0.2)	900	Wolframite Monoclinic P2 <sub>1</sub> /n	15.5	24600		-60	206
969	$0.91\text{MgWO}_4-0.09\text{CaTiO}_3$	950	Composite	15.5	20800	7.1	0	441
970	$\text{SrTe}_2\text{O}_5$	580		15.5	8700		-116	444
971	$\text{Cu}_3\text{Nb}_2\text{O}_8$	900/2h	Anorthic	15.6	48400		-75	445
972	$(\text{Mg}_{0.9}\text{Co}_{0.1})_2\text{TiO}_4$	1390/4h	Cubic Fd3m	15.6	162000	10.4	-47	446
973	$(\text{Mg}_{0.96}\text{Mn}_{0.04})_2\text{TiO}_4$	1330	Cubic Fd3m	15.6	237000		-52	443
974	$\text{BaO}-0.33\text{MgO}-0.34\text{WO}_3-0.33\text{TiO}_2$	1500/6h	Perovskite hexagonal	15.6	67000		-10	373
975	$\text{SrPr}_4\text{Si}_3\text{O}_{13}$	1325/4h	Hexagonal apatite P6 <sub>3</sub> /m	15.6	12200		-9	253

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
976	$\text{Mg}_2(\text{Ti}_{0.95}\text{Sn}_{0.05})\text{O}_4$	1390	Cubic Fd3m	15.6	318000	10.8	-45	447
977	$\text{Bi}_4(\text{SiO}_4)_3 + 3 \text{ mol\% B}_2\text{O}_3$		Cubic I-43d	15.6	36300		-22	448
978	$\text{SmNb}_{1-x}(\text{Si}_{1/2}\text{Mo}_{1/2})_x\text{O}_4$ (x=0.69)		Tetragonal scheelite I4 <sub>1</sub> /a	15.6	32800		-38	449
979	$\text{Li}_3(\text{Mg}_{0.95}\text{Ca}_{0.05})_2\text{NbO}_6$	1140	Fdd	15.6	96200	8.9	-18	397
980	$\text{LiZnNbO}_4$	1070	Tetragonal	15.6	85300	9.1	-64	450
981	$(\text{Mg}_{0.95}\text{Co}_{0.05})_2\text{TiO}_4$	1390/4h	Cubic Fd3m	15.7	286000	10.4	-52	446
982	$(\text{Mg}_{0.95}\text{Mn}_{0.05})_2\text{TiO}_4$	1330	Cubic Fd3m	15.7	276000		-53	443
983	$\text{Mg}_{1.8}\text{Ti}_{1.1}\text{O}_4$	1450/4h	Tetragonal P4 <sub>1</sub> 22	15.7	141000	10.57	-52	451
984	$\text{YAlO}_3$	1650/2h	Perovskite Hexagonal P63/mmc	15.7	58000	10	-59	452
985	$\text{Mg}_4\text{Nb}_2\text{O}_9 + 3 \text{ wt\% LiF} + 6 \text{ wt\% CaTiO}_3$	950/5h	Corundum type+mixtures	15.7	22100		-3	453
986	$(1-x)(\text{Al}_{1/2}\text{Ta}_{1/2})\text{O}_2 - x(\text{Mg}_{1/3}\text{Ta}_{2/3})\text{O}_2$ (x=0.2)	1550	Orthorhombic Pbcn	15.7	103600		-40	454
987	$\text{LaTi}_2\text{Al}_9\text{O}_{19}$	1600	Monoclinic	15.7	68200		-22	455
988	$0.7\text{Ba}_2\text{BiV}_3\text{O}_{11} - 0.3\text{TiO}_2$	910	Composite	15.7	53200	8.57	-2	420
989	$\text{Li}_3\text{Bi}_2\text{P}_3\text{O}_{12}$	725	Cubic I-43m	15.8	26600		-130	456
990	$\text{Li}_3\text{NbO}_4$	930/2h	Cubic I-43m	15.8	55000		-49	457
991	$\text{Y}_2\text{Ba}_{0.7}\text{Sr}_{0.3}\text{Cu}_{0.25}\text{Zn}_{0.75}\text{O}_5$		Orthorhombic Pnma	15.8	20700	10.5	-13	393
992	$\text{Li}_2\text{CeO}_3$	720/4h	Cubic Fm3-m	15.8	143700		-123	458
993	$\text{Li}_2\text{TiO}_3 - 13 \text{ wt\% MgO} + 4 \text{ wt\% LiF}$	850/4h		15.8	64500		0	459
994	$\text{SrNdAlO}_4$		K <sub>2</sub> NiF <sub>4</sub> type Tetragonal I4/mmm	15.9	110000		-15	440
995	$\text{Ca}(\text{Ta}_{2-x}\text{Nb}_x)\text{O}_6$ (x=1.5)	1425	Cubic Pm3	15.9	102500		-56	460
996	$\text{YSmBaZnO}_5$		Orthorhombic	15.9	63210	9.9	-23	58
997	$\text{Y}_2\text{Ba}_{0.7}\text{Sr}_{0.3}\text{Cu}_{0.75}\text{Zn}_{0.25}\text{O}_5$		Orthorhombic Pnma	15.9	12450		0.8	393
998	$\text{MgCu}_2\text{Nb}_2\text{O}_8$	1010	Not available	15.9	6780		-46	315
999	$\text{Ba}_3\text{Ti}_5\text{Nb}_6\text{O}_{28} + 5 \text{ wt\% B}_2\text{O}_3$	900/2h	Monoclinic P2 <sub>1</sub> /c	15.9	14000		-13	461
1000	$\text{SmNb}_{1-x}(\text{Si}_{1/2}\text{Mo}_{1/2})_x\text{O}_4$ (x=0.68)		Monoclinic+Tetragonal	15.9	33400		-39	449
1001	$(0.4\text{Bi}_2\text{O}_3 - \text{La}_2\text{O}_3 - \text{MgO} - \text{TiO}_2) -$ $0.6\text{La}(\text{Mg}_{0.5}\text{Ti}_{0.5})\text{O}_3$	900	Composite	15.9	14300		35	462
1002	$\text{BaNb}_{2-x}\text{Ta}_x\text{P}_2\text{O}_{11}$ (x=1.5)	1250	Rhombohedral R-3c	15.9	13200		-25	392

1003	75 wt% ZnNb <sub>2</sub> O <sub>6</sub> ·TiO <sub>2</sub> +25 wt% (SiO <sub>2</sub> -B <sub>2</sub> O <sub>3</sub> -Al <sub>2</sub> O <sub>3</sub> )	875	Composite	15.9	15000		-20	27
1004	Gd <sub>2</sub> BaCuO <sub>5</sub>		Orthorhombic Pbnm	16.0	3320	11.05	-27	384
1005	Mn <sub>4</sub> Nb <sub>2</sub> O <sub>9</sub>	-	Corundum Trigonal P-3c1	16.0	50000		-	329
1006	3CaO-2ZnO-Ta <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1325	Composite	16.0	34500	6.2	-49	230
1007	NdYBaZn <sub>0.45</sub> Cu <sub>0.55</sub> O <sub>5</sub>	1250/50h	Orthorhombic Pnma	16.0	100270		-	463
1008	Ba <sub>10</sub> Ta <sub>7.04</sub> Sn <sub>1.2</sub> O <sub>30</sub>		Trigonal P-3m1	16.0	30000		20	464
1009	Co <sub>4</sub> Nb <sub>2</sub> O <sub>9</sub>	1200	Corundum Trigonal P-3c1	16.0	5000		-10	274
1010	(Mg <sub>0.95</sub> Zn <sub>0.05</sub> )TiO <sub>3</sub>	1320/4h	Ilmenite Trigonal R-3	16.0	210000		-60	465
1011	Y <sub>1.5</sub> Sm <sub>0.5</sub> BaZnO <sub>5</sub>		Orthorhombic Pbnm	16.0	120000	-32		466
1012	Ba <sub>2-2x</sub> Sr <sub>2x</sub> SmSbO <sub>6</sub> (x=0.1)	1500	Perovskite	16.0	93000		-50	467
1013	Sr <sub>2</sub> SmSbO <sub>6</sub>	1550	Perovskite	16.0	93000		-50	467
1014	(1-γ)Li <sub>3</sub> NbO <sub>4</sub> +γLi <sub>2</sub> SnO <sub>3</sub> (γ=0.7)		Composite	16.0	75300		3	409
1015	Tm <sub>2</sub> BaZnO <sub>5</sub>		Orthorhombic Pnma	16.1	8040	9.9	-20	58
1016	Sm <sub>2</sub> Ba(Cu <sub>0.995</sub> Co <sub>0.005</sub> )O <sub>5</sub>		Orthorhombic Pbn	16.1	87800	10	-8	323
1017	(Li <sub>1/2</sub> Nd <sub>1/2</sub> )WO <sub>4</sub>	775/4h	Tetragonal I4 <sub>1</sub> /n	16.1	4210		142	429
1018	MgTiO <sub>3</sub>	1350/4h	Ilmenite Trigonal R-3	16.1	289400		-54	468
1019	(Mg <sub>0.095</sub> Co <sub>0.05</sub> ) <sub>1.8</sub> Ti <sub>1.1</sub> O <sub>4</sub>	1390/4h	Spinel cubic Fd3m	16.1	207500	10.7	-53	469
1020	0.4LiFe <sub>5</sub> O <sub>8</sub> -0.6Li <sub>2</sub> MgTi <sub>3</sub> O <sub>8</sub>	1050/2h	Disordered spinel	16.1	28500		-	470
1021	Nd <sub>2</sub> BaZn <sub>0.5</sub> Cu <sub>0.5</sub> O <sub>5</sub>		Orthorhombic Pnma	16.2	36570		-13	468
1022	Zn <sub>2</sub> Te <sub>3</sub> O <sub>8</sub>	620	Monoclinic C2/c	16.2	66000	4.9	-60	471
1023	(Mg <sub>0.95</sub> Ca <sub>0.05</sub> )TiO <sub>3</sub> +3 mol% V <sub>2</sub> O <sub>5</sub>	1100	Ilmenite Trigonal R-3	16.2	62000		50	472
1024	Er <sub>2</sub> BaZnO <sub>5</sub>	1300	Orthorhombic Pnma	16.3	6836	9.9	-28	58
1025	ErAlO <sub>3</sub>	1650/2h	Perovskite Orthorhombic Pbnm	16.3	44200	10	-40	452
1026	BaO-0.33MgO-0.35WO <sub>3</sub> -0.32TiO <sub>2</sub>	1500	Perovskite Hexagonal	16.3	77000		-10	373
1027	Ba <sub>3</sub> MgNb <sub>2-x</sub> Sb <sub>x</sub> O <sub>9</sub> (x=1)		Perovskite	16.3	33400	6.7	-4	381
1028	0.9(Mg <sub>0.95</sub> Zn <sub>0.05</sub> ) <sub>2</sub> (Ti <sub>0.8</sub> Sn <sub>0.2</sub> )O <sub>4</sub> -0.1 (Ca <sub>0.8</sub> Sr <sub>0.2</sub> )TiO <sub>3</sub> +5.3LiF-Fe <sub>2</sub> O <sub>3</sub> -V <sub>2</sub> O <sub>5</sub>	950	Composite	16.3	30800	8.3	-10	473
1029	(Li <sub>0.5</sub> Yb <sub>0.5</sub> )MoO <sub>4</sub>	820	Tetragonal Scheelite	16.3	6350		53	474
1030	0.7Li <sub>3</sub> (Mg <sub>0.92</sub> Zn <sub>0.08</sub> ) <sub>2</sub> NbO <sub>6</sub> - 0.3Ba <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub>	950	Composite	16.3	50000	8.6	2	475

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
1031	Pb <sub>2</sub> WO <sub>5</sub>	520	Monoclinic	16.4	14800	7.6	-95	476
1032	Co <sub>4</sub> Nb <sub>2</sub> O <sub>9</sub>	1100/10H	Corundum type Trigonal P-3c1	16.4	5000		-11	358,477
1033	Li <sub>3</sub> NbO <sub>4</sub>	1150	Cubic I-43m	16.4	47100	10	-45	478,479
1034	0.8Li <sub>2</sub> Zn <sub>3</sub> Ti <sub>4</sub> O <sub>12</sub> -0.2Li <sub>2</sub> TiO <sub>3</sub> +2 wt% 0.1.5B <sub>2</sub> O <sub>3</sub> -0.6CuO	925/5h	Composite	16.4	69000		-42	480
1035	Li <sub>2</sub> TiO <sub>3</sub> -13 wt% MgO	1325/4h		16.4	87500		-1	459
1036	(Mg <sub>1-x</sub> Zn <sub>x</sub> ) <sub>1.8</sub> Ti <sub>1.1</sub> O <sub>4</sub> (x=0.06)	1360/4h	Cubic Fd3m	16.5	210700		-62	451
1037	Ca(Ta <sub>2-x</sub> Nb <sub>x</sub> )O <sub>6</sub> (x=1.4)	1425	Orthorhombic Pbcn	16.5	84080		-49	460
1038	0.5BaMoO <sub>4</sub> -0.5TiO <sub>2</sub>	1285	Composite	16.5	25200		46	229
1039	ZnW <sub>1-x</sub> Te <sub>x</sub> O <sub>4</sub> (x=0.0)	1100	Wolframite P2 <sub>1</sub> /n	16.5	20500		-70	206
1040	Y <sub>2</sub> Ba <sub>0.7</sub> Sr <sub>0.3</sub> Cu <sub>0.5</sub> Zn <sub>0.5</sub> O <sub>5</sub>		Orthorhombic Pnma	16.5	17670	10.1	-2	393
1041	Y <sub>2</sub> Ba <sub>0.7</sub> Sr <sub>0.3</sub> Cu <sub>0.15</sub> Zn <sub>0.85</sub> O <sub>5</sub>		Orthorhombic Pnma	16.5	23640	10.5	-18	393
1042	Sm <sub>2</sub> BaCuO <sub>5</sub>		Orthorhombic Pnma	16.5	53200	9.9	-5	323
1043	Mg <sub>3</sub> Sm <sub>4</sub> Al <sub>44</sub> O <sub>75</sub>	1680	Magnetoplumbite	16.5	11000		95	145
1044	MgTiO <sub>3</sub> (slow cooled 1°/min)	1350	Ilmenite Trigonal R-3	16.5	220000		-55	481
1045	0.84Ba(Mg <sub>1/2</sub> W <sub>1/2</sub> )O <sub>3</sub> -0.16BaTiO <sub>3</sub>	1500	Perovskite hexagonal	16.6	12000		-11	373
1046	CoCu <sub>2</sub> Nb <sub>2</sub> O <sub>8</sub>	985	Not available	16.6	36800		-37	315
1047	(Mg <sub>0.95</sub> Ca <sub>0.05</sub> )TiO <sub>3</sub> +5 mol% V <sub>2</sub> O <sub>5</sub>	1000	Ilmenite Hexagonal R-3	16.6	13700		-50	472
1048	ErNbO <sub>4</sub>	1500	Monoclinic fergusonite	16.6	43900		-64	363
1049	Li <sub>3-3x</sub> Mg <sub>4x</sub> Nb <sub>(1-x)</sub> O <sub>4</sub> (x=0.2)	1300/2h		16.6	85160	10	-32	479
1050	SrLaAlO <sub>4</sub>		Tetragonal I4/mmm	16.7	149400		-32	440
1051	Mg(Ti <sub>0.95</sub> Sn <sub>0.05</sub> )O <sub>3</sub>		Ilmenite Trigonal R-3	16.7	275000	10.3	-53	447
1052	Ba(Mg <sub>1/2</sub> W <sub>1/2</sub> )O <sub>3</sub>	1500/6h	Perovskite cubic Fm3m	16.7	42000		34	373
1053	0.6Ba(Mg <sub>1/2</sub> W <sub>1/2</sub> )O <sub>3</sub> -0.4BaTiO <sub>3</sub>	1500/6h	Perovskite Hexagonal	16.7	15000		12	373
1054	Y <sub>2</sub> Ba <sub>0.7</sub> Sr <sub>0.3</sub> ZnO <sub>5</sub>		Orthorhombic Pnma	16.7	4920	10.8	-35	393
1055	ZnCu <sub>2</sub> Nb <sub>2</sub> O <sub>8</sub>	900/2h		16.7	41000		-77	482
1056	Sm <sub>2</sub> BaCu <sub>0.99</sub> Co <sub>0.01</sub> O <sub>5</sub>		Orthorhombic Pnma	16.8	90700	9.9	-9	58,323
1057	Y <sub>2</sub> Ba <sub>0.7</sub> Sr <sub>0.3</sub> Cu <sub>0.1</sub> Zn <sub>0.9</sub> O <sub>5</sub>		Orthorhombic Pnma	16.8	23600	10.5	-21	393
1058	70 wt% (La <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub> -TiO <sub>2</sub> in 20:60:20 mol%)+30 wt % BaNd <sub>2</sub> Ti <sub>5</sub> O <sub>14</sub>	800	Composite	16.8	5900	7.1	109	419

1059	(Mg <sub>0.95</sub> Co <sub>0.05</sub> )TiO <sub>3</sub>		Ilmenite Trigonal R-3	16.8	230000	10	-54	483
1060	SmNb <sub>1-x</sub> (Si <sub>1/2</sub> Mo <sub>1/2</sub> ) <sub>x</sub> O <sub>4</sub> (x=0.04)		Monoclini+Tetragonal	16.8	45300		-45	449
1061	1-xCeO <sub>2</sub> -xSm <sub>2</sub> O <sub>3</sub> (x=0.25)	1650	Cubic fluorite Fm3m	16.8	29650		-56	413
1062	Li <sub>3-3x</sub> Mg <sub>84x</sub> Nb <sub>(1-x)</sub> O <sub>4</sub> (x=1/3)	1300/2h		16.8	79600	10	-22	479
1063	[Mg <sub>0.5</sub> Zn <sub>0.5</sub> ] <sub>0.95</sub> Co <sub>0.05</sub> ] <sub>2</sub> TiO <sub>4</sub> +8 wt% BCB	925	Composite	16.8	28000		-29	484
1064	(Na <sub>0.5</sub> Bi <sub>0.5</sub> ) <sub>0.4</sub> Ca <sub>0.6</sub> MoO <sub>4</sub>	800	Tetragonal scheelite	16.8	31800		-17	343
1065	0.36Ba <sub>5</sub> Nb <sub>4</sub> O <sub>15</sub> -0.64BaWO <sub>4</sub>	1100	Composite	16.9	56700		-4	485
1066	Co <sub>2</sub> La <sub>4</sub> Ti <sub>3</sub> Si <sub>(4-x)</sub> O <sub>22-d</sub> (x=0)	1275	Perrierite Monoclinic P2 <sub>1</sub> /a	16.9	35100	4.73	-164	486
1067	(1-x)CeO <sub>2</sub> -xEu <sub>2</sub> O <sub>3</sub> (x=0.85)	1600	Cubic fluorite Fm3m	16.9	64700		-39	413
1068	Sm <sub>2</sub> BaCu <sub>0.25</sub> Zn <sub>0.75</sub> O <sub>5</sub>	1300/2h	Orthorhombic Pnma	16.9	42200	-4.6		405
1069	0.4Li <sub>2</sub> Zn <sub>3</sub> Ti <sub>4</sub> O <sub>12</sub> -0.6Ba <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub>	950	Composite	16.9	51300		3	487
1070	3CaO-2ZnO-Ta <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1400	Mixture	17.0	30000	6.6	-47	230
1071	CeO <sub>2</sub> -0.5WO <sub>3</sub> -0.5TiO <sub>2</sub>	1130	Mixture	17.0	45500		7	488
1072	Mg <sub>5</sub> Ta <sub>4</sub> O <sub>15</sub>	1550	Pseudo-brookite Orthorhombic Cmc	17.0	14400	7.2	-15	325
1073	BaNb <sub>2</sub> O <sub>6</sub>		Columbite Orthorhombic C22 <sub>21</sub>	17.0	2600	7.01		489
1074	Ba(Mg <sub>1/2</sub> W <sub>1/2</sub> )O <sub>3</sub>	1550/6h	Perovskite Fm3m	17.0	57000		-34	373,432
1075	Ca <sub>5</sub> Ta <sub>2</sub> HfO <sub>12</sub>	1700	Perovskite Orthorhombic Pnma	17.0	18000	5.9	-32	490
1076	MgTiO <sub>3</sub>		Ilmenite Trigonal R-3	17.0	166400		-50	491,492
1077	Mg <sub>0.95</sub> Co <sub>0.05</sub> TiO <sub>3</sub>	1200/3h	Ilmenite Trigonal R-3	17.0	170000	9.4	-40	493
1078	ErAlO <sub>3</sub>		Perovskite Orthorhombic Pbnm	17.0	44200	10	-40	452
1079	Bi <sub>2</sub> O <sub>3</sub> -4MoO <sub>3</sub>	600	Mixture	17.0	9300		-160	494
1080	Ba <sub>2</sub> TeO <sub>5</sub>	950	Monoclinic	17.0	49600	12	-124	277
1081	30 vol% Al <sub>2</sub> O <sub>3</sub> +BaO-ZnO-SrO-CaO-Nd <sub>2</sub> O <sub>3</sub> -TiO <sub>2</sub> -B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> glass	900	Composite	17.0	800		-2	495
1082	Nd <sub>2</sub> Sn <sub>2</sub> O <sub>7</sub>	1550/9h	Cubic	17.0	33100		-55	496
1083	Dy <sub>2</sub> BaZnO <sub>5</sub>	1320	Orthorhombic	17.1	29669	9.9	-2	58
1084	CuNb <sub>2</sub> O <sub>6</sub>	1000	Columbite Pbcn	17.1	7100	7.4	-45	489
1085	BaO-0.34 MgO-0.35 WO <sub>3</sub> -0.31TiO <sub>2</sub>	1500/6h	Perovskite Hexagonal	17.1	75000		-8	373
1086	Eu <sub>2</sub> BaCuO <sub>5</sub>		Orthorhombic Pbnm	17.1	9820		-25	497

(continued)



No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
1087	LaSrAlO <sub>4</sub>	1450	Tetragonal K <sub>2</sub> NiF <sub>4</sub> type	17.1	30770	10.77	3	435
1088	(Mg <sub>0.95</sub> Zn <sub>0.05</sub> )TiO <sub>3</sub>	1300	Ilmenite Trigonal R-3	17.1	264000	7	-40	498
1089	NdYBaZn <sub>0.45</sub> Cu <sub>0.55</sub> O <sub>5</sub>			17.1	100300	-30		463
1090	Ba(Ni <sub>1/2</sub> W <sub>1/2</sub> )O <sub>3</sub>	1450	Perovskite Cubic Fm3m	17.1	36300	13.3	-68	432
1091	SmNb <sub>1-x</sub> (Si <sub>1/2</sub> Mo <sub>1/2</sub> ) <sub>x</sub> O <sub>4</sub> (x=0.03)		Monoclinic+Tetragonal	17.1	46200		-46	449
1092	In <sub>2</sub> O <sub>3</sub> -WO <sub>3</sub> -TiO <sub>2</sub>	1175	Multiphase	17.2	5100	6.4	-68	400
1093	Gd <sub>2</sub> BaZnO <sub>5</sub>	1280	Orthorhombic Pbnm	17.2	2580	9.8	-27	58
1094	Eu <sub>2</sub> BaCu <sub>0.25</sub> Zn <sub>0.75</sub> O <sub>5</sub>		Orthorhombic Pbnm	17.2	57920		-29	497
1095	Ho <sub>2</sub> BaZnO <sub>5</sub>	1300	Orthorhombic Pbnm	17.2	6200	9.8	-23	58
1096	Li <sub>3</sub> (Mg <sub>0.92</sub> Zn <sub>0.08</sub> ) <sub>2</sub> NbO <sub>6</sub>	1120/4h	Orthorhombic Fddd	17.2	142300		-23	416
1097	CaNb <sub>2</sub> O <sub>6</sub>	1350	Columbite Pbcn	17.3	49600	6.9	-53	489
1098	Mg <sub>3</sub> Eu <sub>4</sub> Al <sub>44</sub> O <sub>75</sub>	1680	Magnetoplumbite	17.3	11000		147	145
1099	Li <sub>2</sub> MgTiO <sub>4</sub>	1360	Rock salt	17.3	97300	9.8	-27	499
1100	1-xCeO <sub>2</sub> -xTm <sub>2</sub> O <sub>3</sub> (x=0.25)	1650	Cubic fluorite Fm3m	17.3	27850		-40	413
1101	Co <sub>2</sub> La <sub>4</sub> Ti <sub>3</sub> Si <sub>(4-x)</sub> O <sub>22-d</sub> (x=0.05)	1300	Perrierite Monoclinic P2 <sub>1</sub> /a	17.3	46600	4.75	-177	486
1102	MgTiO <sub>3</sub> (Pecchini method)+0.1 mol% Cr	1150	Ilmenite Trigonal R-3	17.3	136400			500
1103	CoZnTiO <sub>4</sub>	1200	Cubic Spinel Fd-3m	17.3	97600	8.8	-36	501
1104	Co <sub>2</sub> La <sub>4</sub> Ti <sub>3</sub> Si <sub>(4-x)</sub> O <sub>22-d</sub> (x=0.1)	1300	Perrierite monoclinic P2 <sub>1</sub> /a	17.4	48700	4.68	-155	486
1105	Mg(Sn <sub>0.05</sub> Ti <sub>0.95</sub> )O <sub>3</sub>	1390/4h	Trigonal Ilmenite R-3H	17.4	322000		-54	502
1106	Ba <sub>8</sub> Zn(Nb <sub>6-x</sub> Sb <sub>x</sub> )O <sub>24</sub> (x=2.4)	1425	Not available	17.4	9800		-3	503
1107	LuNbO <sub>4</sub>	1500	Monoclinic fergusonite I2	17.4	56600		-64	363
1108	Ba(Mg <sub>0.33</sub> Ta <sub>0.13</sub> Ti <sub>0.267</sub> W <sub>0.267</sub> )O <sub>3</sub>	1560	Perovskite Hexagonal P-3m1	17.4	43780	7.1	-29	438
1109	CaTeO <sub>3</sub>	840		17.4	49300	10		223
1110	MgTi <sub>2</sub> O <sub>5</sub>	1500/3h	Orthorhombic Psuedobrookite Bbmm	17.4	47000		-66	418
1111	MgTiO <sub>3</sub> (Chemical Pecchini method)	1150	Ilmenite, trigonal R-3H	17.4	166400		-	500
1112	0.5Li <sub>2</sub> Zn <sub>3</sub> Ti <sub>4</sub> O <sub>12</sub> -0.5Ba <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub>	950	Composite	17.4	56500		-5	487
1113	0.6Li <sub>2</sub> Zn <sub>3</sub> Ti <sub>4</sub> O <sub>12</sub> -0.4Ba <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub>	975	Composiite	17.5	73100		-16	487
1114	BaTe <sub>4</sub> O <sub>9</sub>	500	Monoclinic	17.5	54700		-90	277,504
1115	0.96MgTiO <sub>3</sub> -0.036SrTiO <sub>3</sub> +4 wt% CuO	1070/2h	Composite	17.5	25100		0	505

1116	0.74CaWO <sub>4</sub> -0.26TiO <sub>2</sub>	1250	Composite	17.5	27000		0	506
1117	(Zn <sub>1-x</sub> Cu <sub>x</sub> ) <sub>2</sub> TiO <sub>4</sub> (x=0.005)	1060/4h	Cubic Fd3m	17.5	7300		–	507
1118	0.95MgTiO <sub>3</sub> -0.05CaTiO <sub>3</sub> +5 wt% B <sub>2</sub> O <sub>3</sub>	1050	Composite	17.5	22000		–2	508
1119	0.8Li <sub>2</sub> Zn <sub>3</sub> Ti <sub>4</sub> O <sub>12</sub> -0.2Li <sub>2</sub> TiO <sub>3</sub> +2 wt% 0.4B <sub>2</sub> O <sub>3</sub> -0.6CuO	925/5h	Composite	17.5	71000		–44	480
1120	Mg(Zr <sub>0.05</sub> Ti <sub>0.95</sub> )O <sub>3</sub> +1 wt% B <sub>2</sub> O <sub>3</sub>	1270	Ilmenite Cubic R-3	17.6	108000		2	509
1121	DyAlO <sub>3</sub>	1650/2h	Perovskite Orthorhombic Pnma	17.6	38000	10	–34	452
1122	Nd <sub>2</sub> BaCuO <sub>5</sub>		Tetragonal I4/mcm	17.6	2200		–18	463
1123	ZnWO <sub>4</sub>	1100	Monoclinic P2/c	17.6	65000		–60	150
1124	Ba <sub>a</sub> MgWO <sub>6</sub>		Perovskite Cubic Fm3m	17.6	45200	10.1		432
1125	Co <sub>2</sub> La <sub>4</sub> Ti <sub>3</sub> Si <sub>(4-x)</sub> O <sub>22-d</sub> (x=0.02)	1275	Perrierite Monoclinic P2 <sub>1</sub> /a	17.6	40800	4.73	–174	486
1126	MWF-38+10 wt% Li <sub>2</sub> O-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -CaO-Al <sub>2</sub> O <sub>3</sub> (28:27:30:5:10)	875	Composite	17.7	3700		–15	510
1127	MgTiO <sub>3</sub> +1 mol% Nb <sub>2</sub> O <sub>5</sub>	1350	Ilmenite R-3H, Trigonal	17.7	175000		–	511
1128	0.95MgTiO <sub>3</sub> -0.05CaTiO <sub>3</sub> +15 wt% LMZBS	1050	composite	17.7	29000		–10	508
1129	Ca(Nb <sub>0.93</sub> Ta <sub>0.07</sub> ) <sub>2</sub> O <sub>6</sub>	14004h	Orthorhombic columbite Pbcn	17.7	117000		–51	512
1130	Mg <sub>0.97</sub> Zn <sub>0.03</sub> TiO <sub>3</sub> +0.5 mol% Zn	1275	Ilmenite	17.7	277500	8.5	–55	513
1131	Li <sub>2</sub> ZrO <sub>3</sub> +1 wt% BaO-CuO	900	Monoclinic C2/c	17.8	4300		12	390
1132	0.94Mg <sub>2</sub> TiO <sub>4</sub> -0.6SrTiO <sub>3</sub>	1440/4h	Composite	17.8	70900	10	–3	514
1133	Co <sub>2</sub> La <sub>4</sub> Ti <sub>3</sub> Si <sub>(4-x)</sub> O <sub>22-d</sub> (x=0.25)	1250	Perrierite Monoclinic P2 <sub>1</sub> /a	17.8	30700	4.7	–150	486
1134	CeO <sub>2</sub> -WO <sub>3</sub> -TiO <sub>2</sub>	1025	Multiphase	17.8	13100	6.2	85	400
1135	DyNbO <sub>4</sub>	1250	Monoclinic fergusonite I2	17.8	38500		–66	363
1136	(Zr <sub>0.8</sub> Sn <sub>0.2</sub> )TiO <sub>4</sub> +10 wt% BaO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -Li <sub>2</sub> O-CuO	950/4h	Composite	17.8	12700		1	515
1137	NiTiO <sub>3</sub>	1475/4h	Trigonal R-3 Ilmenite	17.8	13900		–51	516
1138	0.96MgTiO <sub>3</sub> -0.036SrTiO <sub>3</sub>	1170/2h	Composite	17.9	30400	9	5	505
1139	Eu <sub>2</sub> BaCu <sub>0.5</sub> Zn <sub>0.5</sub> O <sub>5</sub>		Orthorhombic Pnma	17.9	49849		–30	497
1140	(Zn <sub>1-x</sub> Cu <sub>x</sub> ) <sub>2</sub> TiO <sub>4</sub> (x=0.01)	1060/4h	Cubic Fd3m	17.9	7500			517
1141	MgTiO <sub>3</sub> /CaTiO <sub>3</sub> layered		Layered-composite	17.9	61400	9.64	0	518

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No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
1142	Ba[Ti <sub>1-x</sub> (Co <sub>0.5</sub> W <sub>0.5</sub> ) <sub>x</sub> O <sub>3</sub> (x=0.61)		Perovskite	18.0	7700		-14	519
1143	0.94(Mg <sub>0.95</sub> Zn <sub>0.05</sub> ) <sub>2</sub> TiO <sub>4</sub> -0.06SrTiO <sub>3</sub>	1270	Cubic spinel	18.0	125600	10	0	520
1144	(Zn <sub>0.95</sub> Cu <sub>0.05</sub> ) <sub>2</sub> TiO <sub>4</sub>	1060	Cubic Fd3m	18.0	9700	7.4	-166	517
1145	0.91Mg <sub>2</sub> (Ti <sub>0.95</sub> Sn <sub>0.05</sub> )O <sub>4</sub> -0.09CaTiO <sub>3</sub>		Composite	18.0	92000		0	521
1146	2/3LaCa <sub>0.5</sub> Zr <sub>0.5</sub> O <sub>3</sub> -1/3CaTiO <sub>3</sub>	1575	Composite	18.0	26000	5.3	-75	522
1147	5MgO-Ta <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1325	Mixture	18.0	114000	6.61	-56	230
1148	Zn <sub>0.6</sub> Mg <sub>0.4</sub> TiO <sub>3</sub> +5 wt% B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -ZnO-K <sub>2</sub> O	1100	Composite	18.0	29400		-	523
1149	Sm <sub>2</sub> BaCu <sub>0.5</sub> Zn <sub>0.5</sub> O <sub>5</sub>		Orthorhombic Pbnm	18.0	65700	-6.4		524
1150	(1-x)LaCa <sub>0.5</sub> Zr <sub>0.5</sub> O <sub>3</sub> -xCaTiO <sub>3</sub> (x=1/3)		Composite	18.0	16000		-75	522
1151	0.5CeO <sub>2</sub> -0.5Sm <sub>2</sub> O <sub>3</sub>	1650	Composite	18.0	90000		-30	525
1152	5ZnO-Nb <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1050	Mixture	18.0	6000	5.9	-57	230
1153	5MgO-Ta <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1325	Mixture	18.0	114000	6.6	-47	230
1154	CeO <sub>2</sub> -0.5NiO-0.5TiO <sub>2</sub>	1200	Mixture	18.0	25300		-58	488
1155	0.8Li <sub>2</sub> Zn <sub>3</sub> Ti <sub>4</sub> O <sub>12</sub> -0.2Li <sub>2</sub> TiO <sub>3</sub>	1160	Cubic P4 <sub>2</sub> 32	18.0	100000		-48	480
1156	Ca <sub>9</sub> Nd <sub>2</sub> W <sub>4</sub> O <sub>24</sub>	1450	Tetragonal scheelite 141/a	18.0	4050			526
1157	Eu <sub>2</sub> BaZnO <sub>5</sub>		Orthorhombic Pnma	18.1	23360		-25	497
1158	0.7Li <sub>2</sub> Zn <sub>3</sub> Ti <sub>4</sub> O <sub>12</sub> -0.3Ba <sub>3</sub> (VO <sub>4</sub> ) <sub>2</sub>	1000	Composite	18.1	88980		-25	487
1159	MgTiO <sub>3</sub> /CaTiO <sub>3</sub> /MgTiO <sub>3</sub> layered		Layered-composite	18.1	61400	9.6	0	518
1160	MgTiO <sub>3</sub> +6 wt% CuO-Bi <sub>2</sub> O <sub>3</sub> -V <sub>2</sub> O <sub>5</sub>	900/2h	Ilmenite Trigonal R-3	18.1	20300		-57	527
1161	Nd <sub>2</sub> BaZn <sub>0.25</sub> Cu <sub>0.75</sub> O <sub>5</sub>	1250/10h	Tetragonal I4/mcm	18.1	25170		-18	463
1162	BaO-0.32MgO-0.28WO <sub>3</sub> -0.4TiO <sub>2</sub>	1500/6h	Composite	18.1	48000		-3	407
1163	Ba(Ni <sub>1/2</sub> W <sub>1/2</sub> )O <sub>3</sub>	1450	Perovskite cubic Fm3m	18.1	52000	8.22	-45	528
1164	0.92(Mg <sub>0.95</sub> Co <sub>0.05</sub> ) <sub>2</sub> TiO <sub>4</sub> -0.08(Ca <sub>0.8</sub> Sr <sub>0.2</sub> ) TiO <sub>3</sub> +0.5 wt% B <sub>2</sub> O <sub>3</sub>	1200/4h	Composite	18.1	95000	9.5	-5	529
1165	0.91(Mg <sub>0.97</sub> Co <sub>0.03</sub> ) <sub>2</sub> (Ti <sub>0.95</sub> Sn <sub>0.05</sub> )O <sub>4</sub> - 0.09CaTiO <sub>3</sub>	1390/4h	Composite	18.1	87600		4	530
1166	Sr <sub>1-x</sub> Ca <sub>x</sub> LaAlO <sub>4</sub> (x=0.4)	1475	Tetragonal I4/mmm	18.1	150500		-26	531
1167	Mg(Zr <sub>0.05</sub> Ti <sub>0.95</sub> )O <sub>3</sub>	1420	Ilmenite Trigonal R-3	18.1	380000		-50	532
1168	0.85Li <sub>2</sub> TiO <sub>3</sub> -0.5Li <sub>2</sub> WO <sub>4</sub>	950	Mixture	18.1	81000		2	533

1169	CaNb <sub>2</sub> O <sub>6</sub>	1400/4h	Orthorhombic columbite Pbcn	18.1	50000		-54	534
1170	(Zn <sub>1-x</sub> Cu <sub>x</sub> ) <sub>2</sub> TiO <sub>4</sub> (x=0.05)	1060/4h	Cubic Fd3m	18.2	7500		-82	507
1171	Mg(Zr <sub>0.05</sub> Ti <sub>0.95</sub> )O <sub>3</sub> +1.5 wt% CuO	1300	Ilmenite Trigonal R-3	18.2	223000		-2	535
1172	(Zn <sub>0.95</sub> Mn <sub>0.05</sub> ) <sub>2</sub> TiO <sub>4</sub>	1180	Cubic Fd3m	18.2	9550	7.5	-200	517
1173	Mg <sub>1+δ</sub> TiO <sub>3+δ</sub> (δ=0.03)	1400	Ilmenite Trigonal R-3	18.2	326600		-50	536
1174	CaSmAlO <sub>4</sub>		K <sub>2</sub> NiF <sub>4</sub> type Tetragonal I4/mmm	18.2	51060		-3	537
1175	CaNdAlO <sub>4</sub>		K <sub>2</sub> NiF <sub>4</sub> type Tetragonal I4/mmm	18.2	17980		-52	537
1176	0.9(Mg <sub>0.95</sub> Zn <sub>0.05</sub> ) <sub>2</sub> (Ti <sub>0.8</sub> Sn <sub>0.2</sub> )O <sub>4</sub> - 0.1(Ca <sub>0.8</sub> Sr <sub>0.2</sub> )TiO <sub>3</sub>	950	Spinel+Perovskite Composite	18.2	49100	8.1	15	473
1177	SrLa <sub>2</sub> Al <sub>2</sub> O <sub>7</sub>		Tetragonal R-P phase	18.2	71700		-22	538
1178	Zn(Mn <sub>1-x</sub> Ti <sub>x</sub> ) <sub>3</sub> O <sub>7</sub> (x=0.68)+5 wt% ZnO-B <sub>2</sub> O <sub>3</sub>	900	Multiphase	18.2	12000		-4	539
1179	0.6LiMgVO <sub>4</sub> -0.4TiO <sub>2</sub>	740	Composite	18.2	21600		-11	140
1180	BiCuVO <sub>6</sub>	675	Monoclinic P2 <sub>1</sub> /n	18.2	7800	7.7	-177	540
1181	0.995MgO-0.005BaO-TiO <sub>2</sub>	1320	Cubic Fm3m	18.3	18500	9.83		541
1182	Mg <sub>3</sub> Gd <sub>4</sub> Al <sub>44</sub> O <sub>75</sub>	1680	Magnetoplumbite	18.3	4800		175	145
1183	Mg <sub>3</sub> Tb <sub>4</sub> Al <sub>44</sub> O <sub>75</sub>	1680	Magnetoplumbite	18.3	5900		200	145
1184	0.5ZnNb <sub>2</sub> O <sub>6</sub> -0.5Zn <sub>3</sub> Nb <sub>2</sub> O <sub>8</sub> -12 wt% ZnCuB <sub>2</sub> O <sub>5</sub>	875	Orthorhombic mixture	18.3	39750	5.9	-88	542
1185	Sr(Ni <sub>1/2</sub> W <sub>1/2</sub> )O <sub>3</sub>	1570	Perovskite Cubic Fm3m	18.3	56000	8.4	-50	528
1186	(1-x)CeO <sub>2</sub> -xNd <sub>2</sub> O <sub>3</sub> (x=0.7)	1600	Cubic fluorite Fm3m	18.3	44700		-62	413
1187	Mg <sub>1+δ</sub> TiO <sub>3+δ</sub> (δ=0.02)	1400	Ilmenite Hexagonal R-3	18.3	357600		-50	536
1188	0.93(Mg <sub>0.95</sub> Zn <sub>0.05</sub> ) <sub>1.8</sub> Ti <sub>1.1</sub> O <sub>4</sub> -0.07CaTiO <sub>3</sub>	1375	Composite	18.3	96000		-5	543
1189	0.93(Mg <sub>0.97</sub> Zn <sub>0.03</sub> )(Ti <sub>0.95</sub> Sn <sub>0.05</sub> )O <sub>4</sub> - 0.07CaTiO <sub>3</sub>	1390/4h	Cubic spinel	18.3	94700		-4	426
1190	0.91Mg <sub>2</sub> TiO <sub>4</sub> -0.1(Ca <sub>0.8</sub> Sr <sub>0.2</sub> )TiO <sub>3</sub>	1300/4h	Composite	18.3	90500	9.5	0	544
1191	0.8MgNb <sub>2</sub> O <sub>6</sub> -0.2CaTiO <sub>3</sub>	1300	Composite	18.4		73700	-45	545
1192	GdAlO <sub>3</sub>	1650/2h	Perovskite Orthorhombic	18.4	11000	10	-54	452
1193	(Zr <sub>0.8</sub> Sn <sub>0.2</sub> )TiO <sub>4</sub> +10 wt% BaO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -Li <sub>2</sub> O-CuO	950/8h	Composite	18.4	10500		-0	515
1194	BaNd <sub>2</sub> Ti <sub>5</sub> O <sub>14</sub> +La <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub> -TiO <sub>2</sub>	750	Composite	18.4	6100		4	546

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
1195	0.93(Mg <sub>0.95</sub> Co <sub>0.05</sub> )TiO <sub>4</sub> -0.07SrTiO <sub>3</sub>		Composite	18.4	102200	9.5	1	547
1196	0.88Mg <sub>2</sub> TiO <sub>4</sub> -0.12CaTiO <sub>3</sub> +4 wt% ZnNb <sub>2</sub> O <sub>6</sub>	1360/6h	Composite	18.4	31000	6	0	548
1197	Sm <sub>2</sub> BaZnO <sub>5</sub>		Orthorhombic Pnma	18.5	35500	9.5	-6	549
1198	Sr <sub>1+x</sub> La <sub>1-x</sub> Al <sub>1-x</sub> Ti <sub>x</sub> O <sub>4</sub>	1500		18.5	95000		-9	550
1199	(1-x)CeO <sub>2</sub> -xSm <sub>2</sub> O <sub>3</sub> (x=0.85)	1600	Cubic fluorite Fm3m	18.5	44700		-55	413
1200	(Zn <sub>1-x</sub> Cu <sub>x</sub> ) <sub>2</sub> TiO <sub>4</sub> (x=0.2)	1060/4h	Cubic Fd3m	18.5	7400		-15	507
1201	(Mg <sub>0.7</sub> Zn <sub>0.03</sub> ) <sub>0.95</sub> Co <sub>0.05</sub> TiO <sub>3</sub> +7 wt% BaCu(B <sub>2</sub> O <sub>5</sub> )	950/4h	Composite	18.5	35000		-51	551
1202	Mg <sub>0.95</sub> Zn <sub>0.05</sub> Ti <sub>2</sub> O <sub>5</sub>	1450/4h	Orthorhombic Bbm	18.5	45000		-41	552
1203	0.2Li <sub>2</sub> Zn <sub>3</sub> Ti <sub>4</sub> O <sub>12</sub> -0.8Li <sub>2</sub> TiO <sub>3</sub> +3 wt% 0.4B <sub>2</sub> O <sub>3</sub> -0.6CuO	925/5h	Cubic composite	18.5	42000		-38	480
1204	Li <sub>2</sub> Zn <sub>3</sub> Ti <sub>4</sub> O <sub>12</sub> +2 wt% BCB	900	Cubic Fd-3m	18.5	31100		-36	553
1205	Mg <sub>0.95</sub> Co <sub>0.05</sub> Ti <sub>2</sub> O <sub>5</sub>	1425/4h	Orthorhombic Bbm	18.6	68000		-39	552
1206	(Li <sub>0.5</sub> Er <sub>0.5</sub> )MoO <sub>4</sub>	800	Tetragonal Scheelite	18.6	10650		186	474
1207	(Ca <sub>1+x</sub> Sm <sub>1-x</sub> )(Al <sub>1-x</sub> Ti <sub>x</sub> )O <sub>4</sub> (x=0.02)	1450	K <sub>2</sub> NiF <sub>4</sub> type Tetragonal I4/mmm	18.6	74600		-11	454
1208	Co <sub>2</sub> La <sub>4</sub> Ti <sub>3</sub> Si <sub>(4-x)</sub> O <sub>22-d</sub> (x=0.5)	1250	Perrierite monoclinic P2 <sub>1</sub> /a	18.6	20700	4.6	-131	486
1209	0.77(0.5ZnAl <sub>2</sub> O <sub>4</sub> -0.5TiO <sub>2</sub> )-0.23MgTiO <sub>3</sub>	1390/4h	Composite	18.7	190000		-2	406
1210	DyTiNb <sub>x</sub> Ta <sub>1-x</sub> O <sub>6</sub> (x=0.05)	1575	Orthorhombic Pbcn	18.7	31000	5.7	-28	555
1211	0.96MgTiO <sub>3</sub> -0.036SrTiO <sub>3</sub> +4.5 Wt% CuO	1070/2h	Ilmenite Trigonal R-3	18.7	19600	9		505
1212	(1-x)(Mg <sub>0.95</sub> Ni <sub>0.05</sub> )TiO <sub>3</sub> -xSrTiO <sub>3</sub> (x=0.01)	1300/4h	Composite	18.7	105000		-38	556
1213	Nd <sub>2</sub> BaZn <sub>0.45</sub> Cu <sub>0.55</sub> O <sub>5</sub>	1250/10h	Tetragonal+Orthorhombic	18.8	44100		-20	463
1214	SmNbO <sub>4</sub>	1250	Orthorhombic Ima2	18.8	56300		-40	363
1215	CaNb <sub>2</sub> O <sub>6</sub>	1350	Orthorhombic Pbcn	18.8	49600		-53	557
1216	[(Mg <sub>0.5</sub> Zn <sub>0.5</sub> ) <sub>0.95</sub> Co <sub>0.05</sub> ] <sub>2</sub> TiO <sub>4</sub>	1225	Cubic spinel Fd3m	18.8	206000		-21	558
1217	0.9MgTiO <sub>3</sub> -0.1CaTiO <sub>3</sub> +5 wt% Li <sub>2</sub> O-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub>	950	Composite	18.8	19000		10	559
1218	Mg <sub>0.95</sub> Ni <sub>0.05</sub> Ti <sub>2</sub> O <sub>5</sub>	1425/4h	Orthorhombic bbm	18.8	50000		-48	552
1219	(Li <sub>0.5</sub> Y <sub>0.5</sub> )MoO <sub>4</sub>	780	Tetragonal Scheelite	18.8	10400		193	474

1220	$(1-x)\text{Li}_3\text{Bi}_2\text{P}_3\text{O}_{12}-x\text{TiO}_2$ ( $x=0.45$ )	750	Monoclinic $\text{P2}_1/\text{m}$	18.9	13700		-43	456
1221	$\text{CaYAlO}_4$	1450/3h	$\text{K}_2\text{NiF}_4$ type Tetragonal $\text{I4}/\text{mmm}$	18.9	39980		6	537
1222	$\text{Sr}_{1-x}\text{Ca}_x\text{NdAlO}_4$ ( $x=0.6$ )	1450/3h	$\text{K}_2\text{NiF}_4$ structure	18.9	91300		-13	560
1223	$\text{Sr}_{0.6}\text{Ca}_{0.4}\text{LaAlO}_4+0.15$ wt% $\text{B}_2\text{O}_3$	1300	$\text{K}_2\text{NiF}_4$ structure	18.9	63000		-25	561
1224	$(\text{Ca}_{1+x}\text{Sm}_{1-x})(\text{Al}_{1-x}\text{Ti}_x)\text{O}_4$ ( $x=0$ )	1400	$\text{K}_2\text{NiF}_4$ type Tetragonal $\text{I4}/\text{mmm}$	19.0	54600		-15	554
1225	$\text{Sr}_2\text{AlNbO}_6$ (oxygen atm)	1550	Perovskite	19.0	16000	8.3	-5	562
1226	$\text{YTiNbO}_6$	1400	Aschenite Orthorhombic $\text{Pbcn}$	19.0	8820	8.2	-45	563
1227	$\text{Sm}_{0.1}\text{Y}_{0.9}\text{TiNbO}_6$	1420	Aschenite Orthorhombic $\text{Pbcn}$	19.0	11700		-42	564
1228	$\text{Zn}_{0.6}\text{Mg}_{0.4}\text{TiO}_3+5$ wt% B-Si-Zn-K glass	950	Trigonal R-3	19.0	18950			565
1229	$\text{ZnTiO}_3$	1100	Trigonal R-3	19.0	30000	10	-55	566
1230	$0.96\text{MgTiO}_3-0.036\text{SrTiO}_3+2$ Wt% $\text{B}_2\text{O}_3$	1170/2h	Composite	19.0	75300	9	-9	505
1231	$\text{Bi}_2\text{Mo}_3\text{O}_{12}$	610	Monoclinic $\text{P2}_1/\text{n}$	19.0	21800	7.6	-215	494
1232	$(\text{Zn}_{0.95}\text{Co}_{0.05})_2\text{TiO}_4$	1180	Cubic spinel $\text{Fd}3\text{m}$	19.0	2100	7.3		517
1233	$\text{Ba}_{2-2x}\text{Sr}_{2x}\text{SmSbO}_6$ ( $x=0.4$ )	1500	Perovskite	19.0	30000		-40	467
1234	$\text{Ba}(\text{Zn}_{1/2}\text{W}_{1/2})\text{O}_3$	1250/4h	Cubic perovskite $\text{Fm}3\text{m}$	19.0	14000		-35	567
1235	$\text{Ca}_{1-3x/2}\text{La}_x(\text{Mg}_{1/2}\text{W}_{1/2})\text{O}_3$ ( $x=0.02$ )	1375/2h	Complex perovskite Monoclinic	19.0	55000	-	-75	568
1236	$0.4\text{Li}_2\text{Zn}_3\text{Ti}_4\text{O}_{12}-0.6\text{Li}_2\text{TiO}_3+3$ wt% $0.4\text{B}_2\text{O}_3-0.6\text{CuO}$	900/5h	Composite	19.0	29000		-38	480
1237	$(\text{Nd}_{0.99}\text{Co}_{0.015})_{1.02}\text{Nb}_{0.988}\text{O}_4$	1250/4h	Monoclinic fergusonite $\text{I2}/\text{a}$	19.0	43300		-48	569
1238	$\text{Ca}_9\text{Sm}_2\text{W}_4\text{O}_{24}$	1450	Tetragonal scheelite $141/\text{a}$	19.0	3100			526
1239	$(\text{Ba}_x\text{Mg}_{1-x})(\text{Sn}_{0.05}\text{Ti}_{0.95})\text{O}_3$ ( $x=0.01$ )	1210/4h	Ilmenite type Trigonal	19.0	120000		-42	570
1240	$0.75\text{ZnWO}_4-0.25\text{TiO}_2+0.5$ wt% $\text{Li}_2\text{CO}_3-\text{H}_3\text{BO}_3$	950/2h	Composite	19.0	13500		-11	571
1241	$(\text{Nd}_{0.99}\text{Mn}_{0.015})_{1.02}\text{Nb}_{0.988}\text{O}_4$	1250/4h	Monoclinic fergusonite $\text{I2}/\text{a}$	19.1	38600		-43	569
1242	$(\text{Nd}_{0.99}\text{Ca}_{0.015})_{1.02}\text{Nb}_{0.988}\text{O}_4$	1250/4h	Monoclinic fergusonite $\text{I2}/\text{a}$	19.1	35300		-38	569
1243	$(1-x)\text{MgTiO}_3-x\text{Ca}_{0.8}\text{Sr}_{0.2}\text{TiO}_3$ ( $x=0.02$ )		Composite	19.1	110600		-38	572
1244	$\text{Tb}(\text{Ti}_{1/2}\text{W}_{1/2})\text{O}_4$	1375	Tetragonal Scheelite	19.1	5900	6.6	-6	400
1245	$0.99\text{MgO}-0.01\text{BaO}-\text{TiO}_2$	1320	Composite	19.1	21500	9.53		541
1246	80 wt% $\text{ZnNb}_2\text{O}_6$ , $\text{TiO}_2+20$ wt% $(\text{SiO}_2-\text{B}_2\text{O}_3-\text{Al}_2\text{O}_3)$	875	Composite	19.1	9600		9	27
1247	$0.25\text{Li}_5\text{FeO}_8-0.75\text{Li}_2\text{ZnTi}_3\text{O}_8$	1050	Composite	19.1	11770	6.84	-60	573

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No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
1248	$\text{Nd}(\text{Mg}_{0.47}\text{Ba}_{0.03}\text{Sn}_{0.5})\text{O}_3$	1600/4h	Cubic perovskite	19.1	97500		-64	574
1249	$\text{Li}_2\text{Zn}_3\text{Ti}_4\text{O}_{12}+1.5$ wt% $\text{Li}_2\text{O-ZnO-B}_2\text{O}_3$ glass	900/2h	Cubic $\text{P4}_232$	19.1	63800	9	-49	575
1250	$\text{Pb}_2\text{MoO}_5$	610/2h	Monoclinic	19.1	21960	7.46	-60	576
1251	$(\text{Na}_{0.5}\text{Bi}_{0.5})_{0.5}\text{Ca}_{0.5}\text{MoO}_4$	775	Tetragonal scheelite	19.1	22700		-10	343
1252	$(\text{Ba}_x\text{Mg}_{1-x})(\text{Zr}_{0.05}\text{Ti}_{0.95})\text{O}_3$ ( $x=0.01$ )	1210/4h	Ilmenite type Trigonal	19.1	180000		-38	570
1253	$(\text{Ba}_x\text{Mg}_{1-x})(\text{Zr}_{0.05}\text{Ti}_{0.95})\text{O}_3$ ( $x=0.03$ )	1210/4h	Ilmenite type Trigonal	19.2	156000		-35	570
1254	85 wt% $\text{ZnNb}_2\text{O}_6$ - $\text{TiO}_2$ +15 wt% $(\text{CaO-B}_2\text{O}_3\text{-SiO}_2)$	875	Composite	19.2	11000		17	27
1255	$\text{CaO-Sm}_2\text{O}_3\text{-Al}_2\text{O}_3$	1425	Composite	19.2	120000		-10	577
1256	$0.76\text{Li}_2\text{TiO}_3\text{-}0.24\text{MgO}$	1250	Rocksalt Monoclinic C2c	19.2	106220		4	578
1257	$1\text{-xCeO}_2\text{-xLa}_2\text{O}_3$ ( $x=0.25$ )	1650	Cubic fluorite Fm3m	19.2	14700		-64	413
1258	$(\text{Mg}_{0.95}\text{Co}_{0.05})_2\text{TiO}_4\text{-}0.08(\text{Ca}_{0.8}\text{Sr}_{0.2})\text{TiO}_3$		Composite	19.2	123200	9.2	3	579
1259	$\text{Nd}(\text{Mg}_{0.45}\text{Co}_{0.05}\text{Sn}_{0.5})\text{O}_3$	1550	Perovskite	19.2	68900		-67	580
1260	$\text{Bi}(\text{Sb}_{1-x}\text{Ta}_x)\text{O}_4$ ( $x=0.05$ )	960	Monoclinic I2/c	19.2	60,000		-55	581
1261	$\text{Li}_{2.081}\text{Ti}_{0.676}\text{Nb}_{0.243}\text{O}_3$ +5 wt% LBS glass	850	Composite	19.2	41400		-2	582
1262	$\text{YbTiTaO}_6$	1560	Euxenite Orthorhombic Pbcn	19.3	31800	6.2	-41	583
1263	$\text{CaTe}_2\text{O}_5$	780	Monoclinic	19.3	13400	10		223
1264	$\text{BiSbO}_4$	1080/2h	Monoclinic I2/c	19.3	70000		-62	584
1265	$\text{Nd}(\text{Mg}_{0.5}\text{Sn}_{0.5})\text{O}_3$	1550/4h	Perovskite	19.3	43300		-57	585
1266	$\text{MgTi}_2\text{O}_5$ +10 wt% LBS glass	950/2h	Composite	19.3	6800	-	-16	167
1267	$\text{Ba}(\text{Co}_{1/2}\text{W}_{1/2})\text{O}_3$	1390	Perovskite Cubic Fm3m	19.3	21000	7.76	-55	528
1268	$\text{TeO}_2$	640/15h	Tetragonal $\text{P4}_12_12$	19.3	30000	4	-119	586
1269	$\text{Zn}_2\text{Te}_3\text{O}_8$ +4 wt% $\text{TiO}_2$	650/2h	Monoclinic C2/c	19.3	27000	5.14	-9	471
1270	$\text{LaNbO}_4$	1250	Fergusonite Monoclinic I2/a	19.3	54400		9	363
1271	$\text{Y}(\text{Ti}_{1/2}\text{W}_{1/2})\text{O}_4$	1425	Tetragonal Scheelite	19.3	6200		-19	400
1272	$0.4\text{Li}_2\text{Zn}_3\text{Ti}_4\text{O}_{12}\text{-}0.6\text{Li}_2\text{TiO}_3$	1240	Composite	19.3	28000		-31	480
1273	$\text{Nd}_{2.9/3}\text{Ca}_{0.05}(\text{Mg}_{0.5}\text{Sn}_{0.5})\text{O}_3$	1550/4h	Cubic	19.3	99000		-65	587
1274	$(\text{Ba}_{0.05}\text{Mg}_{0.95})(\text{Zr}_{0.05}\text{Ti}_{0.95})\text{O}_3$	1210/4h	Ilmenite type	19.3	132000		-32	570
1275	$\text{LiNi}_{0.5}\text{Ti}_{0.5}\text{O}_2$	1275/6h	Fm-3m	19.3	51300		-20	588

1276	La(Mg <sub>0.5</sub> Sn <sub>0.5</sub> )O <sub>3</sub> +2 wt% ZBS glass	1400/4h	Cubic	19.4	35800		-86	589
1277	(Ca <sub>1-x</sub> Sm <sub>1-x</sub> )(Al <sub>1-x</sub> Ti <sub>x</sub> )O <sub>4</sub> (x=0.06)	1500	K <sub>2</sub> NiF <sub>4</sub> type Tetragonal I4/mmm	19.4	120700		-9	554
1278	(Nd <sub>0.99</sub> Sr <sub>0.015</sub> ) <sub>1.02</sub> Nb <sub>0.988</sub> O <sub>4</sub>	1250/4h	Monoclinic fergusonite I2/a	19.4	33100		-30	569
1279	Li <sub>2</sub> Zn <sub>3</sub> Ti <sub>4</sub> O <sub>12</sub> +1.5 wt% BCB	900	Cubic Fd-3m	19.4	57600		-40	553
1280	0.94CaNb <sub>2</sub> O <sub>6</sub> -0.06CaTiO <sub>3</sub>	1300	Composite	19.5	69500		-65	545
1281	Ca(La <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1500	Perovskite Monoclinic P2 <sub>1</sub> /n	19.5	30000	9.8	-41	590
1282	CoTiO <sub>3</sub>	1375/5h	Trigonal R-3 Ilmenite	19.5	62500		-49	516
1283	Sm <sub>2</sub> BaZnO <sub>5</sub>	1320/2h	Orthorhombic Pmna	19.5	35500	-6.4		405
1284	ZnTiO <sub>3</sub> +0.25 wt% V <sub>2</sub> O <sub>5</sub>	900	Trigonal R-3	19.5	2700	7.4		591
1285	90 wt% ZnNb <sub>2</sub> O <sub>6</sub> .TiO <sub>2</sub> +10 wt% (SiO <sub>2</sub> -B <sub>2</sub> O <sub>3</sub> -Al <sub>2</sub> O <sub>3</sub> )	900	Composite	19.5	9200		18	27
1286	90 wt% (Mg,Ca)TiO <sub>3</sub> +10 wt% Li <sub>2</sub> O-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub>	950	Composite	19.5	26700		-12	592
1287	Ca <sub>1+x</sub> Nd <sub>1-x</sub> Al <sub>1-x</sub> O <sub>4</sub> (x=0.15)		Tetragonal I4/mmm	19.5	93400		-2	593
1288	Nd(Mg <sub>0.4</sub> Zn <sub>0.1</sub> Sn <sub>0.5</sub> )O <sub>3</sub>	1500/4h	Perovskite	19.5	129200		-66	594
1289	(Zn <sub>0.95</sub> Ni <sub>0.05</sub> ) <sub>2</sub> TiO <sub>4</sub>	1180	Cubic Fd3m	19.5	2200	7.3		517
1290	LaNbO <sub>4</sub> +3 wt% CuO	950/2h	Monoclinic fergusonite I2/a	19.5	49000		1	595
1291	Li <sub>2+x</sub> Ti <sub>1-4x</sub> Nb <sub>3x</sub> O <sub>3</sub> (x=0.07)	1300	Monoclinic rock salt	19.5	84800		-1	596
1292	SrLaAlO <sub>4</sub> (co-precipitation PH=8)	1425	Tetragonal I4/mmm	19.5	56500		-33	597
1293	Nd(Mg <sub>0.43</sub> Ca <sub>0.07</sub> Sn <sub>0.5</sub> )O <sub>3</sub>	1550/4h	Perovskite	19.5	100400			598
1294	(Li <sub>0.5</sub> Gd <sub>0.5</sub> )MoO <sub>4</sub>	750	Tetragonal Scheelite	19.5	3900		209	474
1295	PbO:B <sub>2</sub> O <sub>3</sub> :SiO <sub>2</sub> (70:20:10) glass		Glass	19.6	500	10.3	-155	92
1296	NdNbO <sub>4</sub>	1250	Monoclinic fergusonite I2/a	19.6	33000		-24	363
1297	Sm <sub>2</sub> BaCuO <sub>5</sub>		Orthorhombic Pnma	19.6	3400	11.36	-9	384
1298	(Ca <sub>1+x</sub> Sm <sub>1-x</sub> )(Al <sub>1-x</sub> Ti <sub>x</sub> )O <sub>4</sub> (x=0.1)	1500	K <sub>2</sub> NiF <sub>4</sub> type Tetragonal I4/mmm	19.6	113700		-6	554
1299	(Mg <sub>0.95</sub> Ca <sub>0.05</sub> )TiO <sub>3</sub> +5 mol% B <sub>2</sub> O <sub>3</sub>	1200	IlmeniteTrigonal R-3	19.6	86000	10	-3	472
1300	0.92Ba(Mg <sub>1/2</sub> W <sub>1/2</sub> )O <sub>3</sub> -0.08BaTiO <sub>3</sub>	1500/6h	Perovskite Cubic Fm3m	19.6	37000		-19	373
1301	Nd <sub>0.5</sub> La <sub>1.5</sub> BaZnO <sub>5</sub>			19.6	16320		-1	599
1302	CaNb <sub>2</sub> O <sub>6</sub>	1400	Columbite Pbcn	19.6	21500		13	600
1303	Ca(Sm <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1500	Perovskite	19.6	26500	9.8	-24	590
1304	CaTe <sub>2</sub> O <sub>5</sub>			19.6	12600		-89	444

(continued)



No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
1305	LiYbW <sub>2</sub> O <sub>8</sub>	900	Monoclinic P2/n	19.7	8720		45	48
1306	Ba(Mg <sub>0.33</sub> Ta <sub>0.33</sub> Ti <sub>0.167</sub> W <sub>0.167</sub> )O <sub>3</sub>	1580	Perovskite Trigonal R-3	19.7	58200	6.5	-11	438
1307	(1-y)Li <sub>3</sub> NbO <sub>4-y</sub> Li <sub>2</sub> TiO <sub>3</sub> (y=0.6)		Composite	19.7	91200		24	409
1308	La(Mg <sub>0.5</sub> Sn <sub>0.5</sub> )O <sub>3</sub> +0.5 wt% B <sub>2</sub> O <sub>3</sub>	1500/4h	Perovskite	19.7	45000		-85	601
1309	Li <sub>2</sub> TiO <sub>3</sub> +1 wt% BaO-CuO	900	Monoclinic C2/c	19.7	46300		31	390
1310	La <sub>4</sub> Ti <sub>3</sub> O <sub>12</sub>		Hexagonal	19.7	9950		-10	602
1311	(Ba <sub>x</sub> Mg <sub>1-x</sub> )(Zr <sub>0.05</sub> Ti <sub>0.95</sub> )O <sub>3</sub> (x=0.07)	1210/4h	Ilmenite type Trigonal	19.7	100000		-31	570
1312	Li <sub>2</sub> TiO <sub>3</sub>	1230	Monoclinic C2/c	19.8	23600		39	390
1313	Zn <sub>2</sub> Te <sub>3</sub> O <sub>8</sub> +30 wt% TiTe <sub>3</sub> O <sub>8</sub>	600	Composite	19.8	50000		3	603
1314	(1-y)Li <sub>3</sub> NbO <sub>4-y</sub> +yLi <sub>2</sub> TiO <sub>3</sub> (y=0.6)		Composite	19.8	91200		-24	409
1315	Ca <sub>1.15</sub> Sm <sub>0.85</sub> Al <sub>0.85</sub> Ti <sub>0.15</sub> O <sub>4</sub> +0.15 wt% B <sub>2</sub> O <sub>3</sub>	1325	Tetragonal I4/mmm	19.8	89400		-1	604
1316	Dy(Ti <sub>1/2</sub> W <sub>1/2</sub> )O <sub>4</sub>	1425	Tetragonal Scheelite	19.9	6000	6.6	-5	400
1317	MgNb <sub>2</sub> O <sub>6</sub> +2 wt% CuO	1170	Columbite Orthorhombic Pbcn	19.9	110000	10	-44	605
1318	BaNd <sub>2</sub> Ti <sub>5</sub> O <sub>14</sub> : (20La <sub>2</sub> O <sub>3</sub> -60B <sub>2</sub> O <sub>3</sub> -20TiO <sub>2</sub> ) (60:40 wt%)	850	Tungsten bronze	19.9	8200			606
1319	1-xCeO <sub>2</sub> -xNd <sub>2</sub> O <sub>3</sub> (x=0.4)	1650	Cubic fluorite Fm3m	19.9	34100		-55	413
1320	Ba <sub>8</sub> Zn(Nb <sub>6-x</sub> Sb <sub>x</sub> )O <sub>24</sub> (x=1.8)	1425		19.9	18600		6	503
1321	La <sub>0.97</sub> Sm <sub>0.03</sub> (Mg <sub>0.5</sub> Sn <sub>0.5</sub> )O <sub>3</sub>	1500/4h		19.9	70200		-77	607
1322	(Li <sub>0.5</sub> Sm <sub>0.5</sub> )MoO <sub>4</sub>	640	Tetragonal Scheelite	19.9	4600		231	474
1323	(Sr <sub>1-x</sub> Ca <sub>x</sub> )La <sub>2</sub> Al <sub>2</sub> O <sub>7</sub> (x=0.1)	1600/3h	R-P I4/mmm	19.9	135400		-19	608
1324	Ca(Al <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>		Complex perovskite	20.0	8500	-	-90	609
1325	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>0.95</sub> Ti <sub>0.05</sub> ]O <sub>3-d</sub> +5 wt% Bi <sub>2</sub> O <sub>3</sub>	900/3h	Perovskite	20.0	6500		-4	610
1326	La <sub>0.9</sub> Nd <sub>0.1</sub> NbO <sub>4</sub>	1250	Monoclinic fergusonite I2/a	20.0	45000		-1	363
1327	Ca(Nd <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1500	Perovskite Monoclinic P2 <sub>1</sub> /n	20.0	2400	9.7	-16	590
1328	0.95MgTiO <sub>3</sub> -0.05CaTiO <sub>3</sub> +0.25 wt% CuO	1275/4h	Composite	20.0	51000	7	-8	611
1329	Ca(Nd <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1500	Complex perovskite	20.0	17500	9.6	-33	590

1330	GdTiNbO <sub>6</sub>	1385	Aschenite Orthorhombic Pbcn	20.0	9050	7.27	-52	563
1331	MgO-SiO <sub>2</sub> -TiO <sub>2</sub> +15 wt% ZnO-B <sub>2</sub> O <sub>3</sub> +2.4 wt% Co <sub>2</sub> O <sub>3</sub>	1160	Composite	20.0	100000	10		612
1332	Sm <sub>0.3</sub> Y <sub>0.7</sub> TiNbO <sub>6</sub>	1420	Orthorhombic Pbnm	20.0	19200		-33	564
1333	LaNbO <sub>4</sub>		Monoclinic I2/a	20.0	15000		50	279
1334	Li <sub>2.081</sub> Ti <sub>0.676</sub> Nb <sub>0.243</sub> O <sub>3</sub>	1100	Monoclinic	20.0	50000		13	613
1335	CaO-4ZnO-Nb <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1125	Composite	20.0	9000	5.9	-47	230
1336	5NiO-Nb <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1125	Composite	20.0	8200	5.9	-64	230
1337	CaO-4MgO-Ta <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1360	Composite	20.0	50000	5.6	-33	230
1338	5NiO-Ta <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1300	Composite	20.0	14000	5.9	-53	230
1339	Sr <sub>3</sub> Zn <sub>0.75</sub> Mg <sub>0.25</sub> Nb <sub>2</sub> O <sub>9</sub>	1300	Hexagonal, perovskite	20.0	8500		-16	614
1340	CaO-4Co <sub>3</sub> O <sub>4</sub> -Ta <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1210	Composite	20.0	26000	5.8	-30	230
1341	Ba <sub>1-3x/2</sub> La <sub>x</sub> (Mg <sub>1/2</sub> W <sub>1/2</sub> )O <sub>3</sub> (x=0.02)	1450/2h	Complex perovskite cubic Fm3m	20.0	87680	-	-1	568
1342	xBa(Mg <sub>1/2</sub> W <sub>1/2</sub> )O <sub>3</sub> -(1-x)BaTiO <sub>3</sub> (x=0.92)	1500/6h	Perovskite Fm3m	20.0	37000		-19	373
1343	0.95MgTiO <sub>3</sub> -0.05CaTiO <sub>3</sub>	1400	Ilmenite Trigonal R-3	20.0	56000		0	615
1344	0.94MgTiO <sub>3</sub> -0.06CaTiO <sub>3</sub> +0.25 wt% CuO	1275	Ilmenite Trigonal R-3	20.0	48000		-3	611
1345	0.75MgAl <sub>2</sub> O <sub>4</sub> -0.25TiO <sub>2</sub>		Composite	20.0	10500		0	195
1346	Ba(Mg <sub>1/3</sub> Ta <sub>(2-2x)/3</sub> W <sub>x/3</sub> Ti <sub>x/3</sub> )O <sub>3</sub> (x=0.15)	1550/4h	Perovskite Trigonal R-3	20.0	90000		0	438
1347	Ba[Ti <sub>1-x</sub> (Ni <sub>1/2</sub> W <sub>1/2</sub> ) <sub>x</sub> ]O <sub>3</sub> (x=0.6)	1425	Perovskite Hexagonal P6 <sub>3</sub> /mmc	20.0	42000		-10	616
1348	Zn <sub>3</sub> Nb <sub>2</sub> O <sub>8</sub> +2 wt% V <sub>2</sub> O <sub>5</sub> +0.5 wt% CuO	800	Monoclinic C2/c	20.0	36000	11.8	-	617
1349	BiSbO <sub>4</sub> +V <sub>2</sub> O <sub>5</sub> -CuO	930	Monoclinic I2/c	20.0	40000		-75	618
1350	La <sub>2.98/3</sub> Sr <sub>0.01</sub> (Mg <sub>0.5</sub> Sn <sub>0.5</sub> )O <sub>3</sub>	1550/4h		20.0	57100		-77	619
1351	Ba(Mg <sub>1/2</sub> W <sub>1/2</sub> )O <sub>3</sub>	1550/2h	Perovskite Cubic Fm3m	20.0	120000		-28	620
1352	Ba(Zn <sub>0.49</sub> W <sub>0.5</sub> )O <sub>2.995</sub>	1360/4h	Perovskite Cubic Fm3m	20.0	40000		-35	567
1353	Zn <sub>1.8</sub> Ti <sub>1.1</sub> O <sub>4</sub>	1090	Cubic Fd3m	20.0	20200		-58	451
1354	La <sub>2.98/3</sub> Ba <sub>0.01</sub> (Mg <sub>0.5</sub> Sn <sub>0.5</sub> )O <sub>3</sub> +0.25 wt% CuO	1500/4h		20.0	50000		-78	621
1355	0.5Mg <sub>4</sub> Nb <sub>2</sub> O <sub>9</sub> -0.5CaTiO <sub>3</sub> +1.7 wt% V <sub>2</sub> O <sub>5</sub>	1150/5h	Composite	20.0	48000		-12	622
1356	(Co <sub>0.95</sub> Zn <sub>0.05</sub> )TiO <sub>3</sub>	1350/3h	Trigonal R-3	20.0	107000	9.27	60	623

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
1357	$\text{La}_{2.98/3}\text{Ba}_{0.01}(\text{Mg}_{0.5}\text{Sn}_{0.5})\text{O}_3 + 0.25 \text{ wt\% CuO}$	1500/4h	Not available	20.0	50100		-78	621
1358	$0.95\text{MgTiO}_3 - 0.05\text{CaTiO}_3 + 1 \text{ wt\% ZnO}$	1300	Composite composite	20.0	65000	7	-6	624
1359	$\text{Ba}(\text{Mg}_{1/2}\text{W}_{1/2})\text{O}_3 + x\text{Ba}(\text{Y}_{1/3}\text{W}_{1/3})\text{O}_3 + (x=0.02)$	1575	Cubic Fm-3m Perovskite	20.0	160000		-21	625
1360	$\text{ZnNb}_2\text{O}_6 - 0.2\text{CaTiO}_3 + 4 \text{ wt\% BaCu}(\text{B}_2\text{O}_5)$	950/4h	Composite	20.0	12500		3	626
1361	$0.95\text{MgTiO}_3 - 0.05\text{CaTiO}_3 + 1 \text{ wt\% ZnO} + 0.5 \text{ wt\% WO}_3$	1310		20.0	62000	7	-5	627
1362	$\text{La}(\text{MgSn})_{0.5}\text{O}_3$	1600/4h	Perovskite Monoclinic P2 <sub>1</sub> /n	20.1	63000		-78	628
1363	$\text{La}(\text{Mg}_{0.43}\text{Ba}_{0.07}\text{Sn}_{0.5})\text{O}_3$	1550/2h	Cubic perovskite	20.1	51600	-82	-8	629
1364	$(\text{Ba}_x\text{Mg}_{1-x})(\text{Sn}_{0.05}\text{Ti}_{0.95})\text{O}_3 (x=0.03)$	1210/4h	Ilmenite type Trigonal	20.1	100000		-26	570
1365	$0.96\text{Mg}_{0.95}\text{Co}_{0.05}\text{TiO}_3 - 0.04\text{SrTiO}_3 + 1 \text{ wt\% ZnO}$	1250	Composite	20.1	74000		-8	630
1366	$\text{NdNbO}_4 + 2 \text{ wt\% CaF}_2$	1225	Monoclinic fergusonite I2/a	20.1	75000		-19	631
1367	$(1-x)(\text{Mg}_{0.95}\text{Ni}_{0.05})\text{TiO}_3 - x\text{SrTiO}_3 (x=0.03)$	1300/4h	Composite	20.1	85000		-11	556
1368	$\text{SrNb}_2\text{O}_6$	1300	Columbite Monoclinic P2 <sub>1</sub> /c	20.1	16900	6.5	-	489
1369	$0.55\text{LiMgVO}_4 - 0.45\text{TiO}_2$	760	Composite	20.1	20100		16	140
1370	$\text{Zn}_2\text{TiO}_4$	1300/2h	Cubic Fd3m	20.2	19000		-55	632
1371	$(\text{Ca}_{1+x}\text{Sm}_{1-x})(\text{Al}_{1-x}\text{Ti}_x)\text{O}_4 (x=0.15)$	1400	K <sub>2</sub> NiF <sub>4</sub> type Tetragonal I4/mmm	20.2	97800		-0.5	554
1372	$\text{Ba}_3\text{NiNb}_{2-x}\text{Sb}_x\text{O}_9 (x=0.5)$		Cubic Pm3m	20.2	16780	6	-29	381
1373	$\text{La}_{1-x}\text{Bi}_x(\text{Mg}_{0.5}\text{Sn}_{0.5})\text{O}_3 (x=0.1)$			20.2	58100		-84	633
1374	$\text{La}(\text{Mg}_{0.4}\text{Ca}_{0.1}\text{Sn}_{0.5})\text{O}_3$	1500	Perovskite	20.2	80500		-79	634
1375	$\text{La}(\text{Mg}_{0.4}\text{Ni}_{0.1}\text{Sn}_{0.5})\text{O}_3$	1550/4h		20.2	74600		-85	635
1376	$\text{La}_{0.97}\text{Yb}_{0.03}(\text{Mg}_{0.5}\text{Sn}_{0.5})\text{O}_3$			20.2	56800		-79	636
1377	$\text{MgLi}_{2/3}\text{Ti}_{4/3}\text{O}_4$	1125/2h	Cubic Fd-3m	20.2	62300		-27	637
1378	$(1-x)\text{MgTiO}_3 - x\text{Ca}_{0.8}\text{Sr}_{0.2}\text{TiO}_3 (x=0.04)$		Ilmenite Hexagonal R-3	20.2	97200		-21	572
1379	$0.2\text{Li}_2\text{Zn}_3\text{Ti}_4\text{O}_{12} - 0.8\text{Li}_2\text{TiO}_3$	1240	Composite	20.2	24000		-11	480
1380	$(\text{Ba}_x\text{Mg}_{1-x})(\text{Sn}_{0.05}\text{Ti}_{0.95})\text{O}_3 (x=0.05)$	1210/4h	Ilmenite type Trigonal	20.2	84000		-17	570
1381	$(\text{Ba}_x\text{Mg}_{1-x})(\text{Sn}_{0.05}\text{Ti}_{0.95})\text{O}_3 (x=0.07)$	1210/4h	Ilmenite type Trigonal	20.3	75000		-14	570

1382	SrLaGaO <sub>4</sub>	1275/3h	Tetragonal I4/mmm	20.3	16200		-34	638
1383	La <sub>2</sub> BaZnO <sub>5</sub>		Tetragonal I4/mcm	20.3	17800		-0.9	599,639
1384	NdLaBaZnO <sub>5</sub>		Orthorhombic	20.3	7900		-5	599
1385	ZnTiO <sub>3</sub> +0.5 wt% V <sub>2</sub> O <sub>5</sub>	900	Hexagonal R-3	20.3	5200	7.8		591
1386	90 wt% ZnNb <sub>2</sub> O <sub>6</sub> .TiO <sub>2</sub> +10 wt% (Li <sub>2</sub> O- B <sub>2</sub> O <sub>3</sub> .SiO <sub>2</sub> )	875	Composite	20.3	8200		5	27
1387	0.95(Mg <sub>0.95</sub> Co <sub>0.05</sub> )TiO <sub>3</sub> -0.05CaTiO <sub>3</sub>	1275/4h	Ilmenite Hexagonal R-3	20.3	107000	7	-23	422
1388	CeO <sub>2</sub> .(at 30K)	1675	Cubic fluorite Fm3m	20.3	600000	5.5		640
1389	Pr(Ti <sub>1/2</sub> W <sub>1/2</sub> )O <sub>4</sub>	1300	Tetragonal Scheelite	20.3	6900	6.53	-20	400
1390	MnTa <sub>2</sub> O <sub>6</sub>	1350	Columbite Orthorhombic Pbcn	20.3	16500		-44	600
1391	(Li <sub>0.5</sub> Nd <sub>0.5</sub> )MoO <sub>4</sub>	660	Tetragonal Scheelite	20.3	3000		235	474
1392	(1-x)Mg <sub>0.95</sub> Ni <sub>0.05</sub> Ti <sub>0.98</sub> Zr <sub>0.02</sub> O <sub>3</sub> -xSrTiO <sub>3</sub> (x=0.04)		Composite	20.3	85400		3	641
1393	SmAlO <sub>3</sub>	1650/2h	Orthorhombic Pbnm	20.4	65000	10	-74	452
1394	MnTiO <sub>3</sub>	1350/2h	Hexagonal R-3(148) Ilmenite	20.4	15200		-56	516
1395	Ba <sub>3</sub> NiNb <sub>2-x</sub> Sb <sub>x</sub> O <sub>9</sub> (x=1)		Hexagonal P6 <sub>3</sub> mc	20.4	43880	6.3	-18	381
1396	CoNb <sub>2</sub> O <sub>6</sub>	1300/4h	Columbite Pbcn	20.5	81000		-70	489,642
1397	(Ba <sub>x</sub> Mg <sub>1-x</sub> )(Sn <sub>0.05</sub> Ti <sub>0.95</sub> )O <sub>3</sub> (x=0.1)	1210/4h	Ilmenite type Trigonal	20.5	37000		-3	570
1398	Li <sub>2</sub> Ti <sub>1-x</sub> (Zn <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>x</sub> O <sub>3</sub> (x=0.2)		Monoclinic C2/c	20.5	75300		15	643
1399	Sm <sub>0.4</sub> Y <sub>0.6</sub> TiNbO <sub>6</sub>	1400		20.5	15000		-30	564
1400	Co <sub>1+0.01</sub> Nb <sub>2</sub> O <sub>6</sub> (sintered in O <sub>2</sub> )	1400	Columbite Pbcn	20.5	114000		-60	644
1401	Sr <sub>2</sub> La <sub>2</sub> MgW <sub>2</sub> O <sub>12</sub>	1525	Trigonal R-3m	20.5	35000		-83	645
1402	SrNd <sub>2</sub> Al <sub>2</sub> O <sub>7</sub>		Tetragonal R-P phase	20.5	65500		-4	538
1403	(Ba <sub>0.1</sub> Mg <sub>0.9</sub> )(Zr <sub>0.05</sub> Ti <sub>0.95</sub> )O <sub>3</sub>	1210/4h	Ilmenite type	20.6	25000		-28	570
1404	ZnLi <sub>2/3</sub> Ti <sub>4/3</sub> O <sub>4</sub>	1075	Cubic Fd-3m	20.6	106700		-48	553
1405	0.5CeO <sub>2</sub> -0.5BaTi <sub>4</sub> O <sub>9</sub> +12 wt% B <sub>2</sub> O <sub>3</sub> +1 wt% CuO	950/4h	Cubic fluorite Fm3m+Orthorhombic Pnmm	20.6	17000	5.7	48	646
1406	ErTiTaO <sub>6</sub>	1560	Euxenite orthorhombic	20.6	85500		-29	583
1407	(Li <sub>0.5</sub> Ce <sub>0.5</sub> )MoO <sub>4</sub>	580	Tetragonal Scheelite	20.6	2000		228	474
1408	Ca(La <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1500	Perovskite	20.6	38000	9.4	-51	590

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
1409	MgTiO <sub>3</sub> +5 mol% Bi <sub>2</sub> O <sub>3</sub> -7 mol% V <sub>2</sub> O <sub>5</sub>	875	Ilmnite Trigonal R-3+second phase	20.6	10420	6.3		647
1410	0.97MgO-0.03BaO-TiO <sub>2</sub>	1320	Mixture phases	20.6	32600	9.35		541
1411	(Ba <sub>x</sub> Mg <sub>1-x</sub> )(Zr <sub>0.05</sub> Ti <sub>0.95</sub> )O <sub>3</sub> (x=0.1)	1210/4h	Ilmneite type Trigonal	20.6	25000		-28	570
1412	ZnTiO <sub>3</sub> +0.75 wt% V <sub>2</sub> O <sub>5</sub>	900	Trigonal R-3	20.6	8800	8.2		591
1413	(Ba <sub>0.75</sub> Sr <sub>0.25</sub> )(Mg <sub>0.5</sub> W <sub>0.5</sub> )O <sub>3</sub>	1400	multiphase	20.6	152600		24	648
1414	Nd <sub>2</sub> BaZn <sub>0.8</sub> Cu <sub>0.2</sub> O <sub>5</sub>		Tetragonal I4/mcm	20.7	11680		-2	463
1415	Sr <sub>3</sub> ZnNb <sub>2</sub> O <sub>9</sub>	1300	Complex perovskite Cubic Pm3m	20.7	7500		-27	614
1416	LaAlO <sub>3</sub> +0.25 wt% CuO	1460	Perovskite Trigonal R-3m	20.7	48000		-80	649
1417	(Ca <sub>1-x</sub> Sm <sub>1-x</sub> )(Al <sub>1-x</sub> Ti <sub>x</sub> )O <sub>4</sub> (x=0.2)	1500	K <sub>2</sub> NiF <sub>4</sub> type Tetragonal I4/mmm	20.7	99400		1	554
1418	CeAlO <sub>3</sub>	1500	Tetragonal P4/mmm	20.7	40110	9.5	-57	650
1419	Ba <sub>4</sub> Ti <sub>3</sub> P <sub>2</sub> O <sub>15</sub>	1200/4h	Monoclinic	20.7	42200		37	651
1420	Ba <sub>2</sub> SmSbO <sub>6</sub>	1500	Perovskite Cubic Fm3m	20.7	86500		25	467
1421	Sr <sub>1-3x/2</sub> La <sub>x</sub> (Mg <sub>1/2</sub> W <sub>1/2</sub> )O <sub>3</sub> (x=0.01)	1550/2h	Complex perovskite Tetragonal	20.7	60000	-	-40	568
1422	Li <sub>2</sub> TiO <sub>3</sub> +2 wt% Li <sub>2</sub> O-ZnO-B <sub>2</sub> O <sub>3</sub> +35 wt% LiZnNbO <sub>4</sub>	900	Composite	20.7	19300		0	652
1423	(Zn <sub>0.95</sub> Ni <sub>0.05</sub> ) <sub>3</sub> Nb <sub>2</sub> O <sub>8</sub> +4 wt% B <sub>2</sub> O <sub>3</sub> -CuO	930/2h	Monoclinic	20.7	98000		-85	653
1424	Ba <sub>2</sub> Mg <sub>0.9</sub> Ca <sub>0.1</sub> WO <sub>6</sub>	1500	Perovskite Cubic Fm3m	20.8	120700		0	441
1425	TeO <sub>2</sub>		Tetragonal P4 <sub>1</sub> 2 <sub>1</sub> 2	20.8	34700		-101	444
1426	0.964MgTiO <sub>3</sub> -0.036SrTiO <sub>3</sub>	1270	Ilmenite Trigonal R-3+Perovskite	20.8	71000		-1	654
1427	La <sub>2-x/3</sub> Na <sub>x</sub> (Mg <sub>1/2</sub> W <sub>1/2</sub> )O <sub>3</sub> (x=0.5)	1450	Perovskite Orthorhombic I222	20.8	5700		-47	655
1428	Nd <sub>2</sub> BaZn <sub>0.7</sub> Cu <sub>0.3</sub> O <sub>5</sub>		Tetragonal I4/mcm	20.8	19793		-3	463
1429	0.96Mg(Zr <sub>0.05</sub> Ti <sub>0.95</sub> )O <sub>3</sub> -0.04SrTiO <sub>3</sub>		Composite	20.8	257000		0	656
1430	(Zn <sub>0.95</sub> Co <sub>0.05</sub> )Nb <sub>2</sub> O <sub>8</sub> +4 wt% B <sub>2</sub> O <sub>3</sub> -CuO	930	Composite	20.8	105000		-84	657
1431	0.94(Mg <sub>0.95</sub> Co <sub>0.05</sub> )TiO <sub>3</sub> -0.06CaTiO <sub>3</sub>	1275/4h	Composite	20.9	102000	7	-10	422
1432	Ca(Sm <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1500	Perovskite	20.9	24500	9.4	-28	590
1433	0.95MgO-0.05BaO-TiO <sub>2</sub>	1320	Composite	20.9	32500	9.06		541
1434	0.96MgTiO <sub>3</sub> -0.04SrTiO <sub>3</sub>	1300/4h	Composite	20.9	135000	9	0	658
1435	Zn <sub>1.01</sub> Nb <sub>2</sub> O <sub>6</sub>	1300/4h	Columbite Pbcn	20.9	120000		-74	642

1436	MnNb <sub>2</sub> O <sub>6</sub>	1150	Columbite Pbcn	20.9	12900	6.8	-74	557
1437	Li <sub>2.081</sub> Ti <sub>0.676</sub> Nb <sub>0.243</sub> O <sub>3</sub> +1.5 wt% B <sub>2</sub> O <sub>3</sub>	880	Monoclinic	20.9	34100		8	613
1438	0.95Mg(Zr <sub>0.05</sub> Ti <sub>0.95</sub> )O <sub>3</sub> -0.05SrTiO <sub>3</sub>	1390	Composite	20.9	203000	6.8	2	659
1439	CoLi <sub>2/3</sub> Ti <sub>4/3</sub> O <sub>4</sub> +1.5 wt% BaCu(B <sub>2</sub> O <sub>5</sub> )	900	Cubic spinel Fd-3m	20.9	27800		-24	660
1440	(1-x)Li <sub>3</sub> Bi <sub>3</sub> P <sub>3</sub> O <sub>12</sub> -xTiO <sub>2</sub> (x=0.50)	750	Monoclinic P2 <sub>1</sub> /m	20.9	14000		-25	456
1441	Li <sub>2</sub> ZnTi <sub>3</sub> O <sub>8</sub> -0.2 SnO <sub>2</sub>	1080/4h	Cubic spinel	10.9	89500		-24	661
1442	(1-x)(Mg <sub>0.95</sub> Ni <sub>0.05</sub> )TiO <sub>3</sub> -xSrTiO <sub>3</sub> (x=0.04)	1300/4h	Composite	20.1	73000		1	556
1443	Mg <sub>1.03</sub> Nb <sub>2</sub> O <sub>6</sub>	1400/4h	Columbite Pcan	21.0	121000		-60	642
1444	0.964MgTiO <sub>3</sub> -0.036SrTiO <sub>3</sub>	1270	Composite	21.0	71000		-1	654
1445	BaTe <sub>2</sub> O <sub>6</sub>	650	Orthorhombic Cmcn	21.0	50300		-51	277
1446	Ca(Mg <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>3</sub>		Complex perovskite	21.0	78000	-	-61	609
1447	Zn <sub>3</sub> Nb <sub>2</sub> O <sub>8</sub>	1150/2h	Monoclinic C2/c	21.0	83300		-71	445,632
1448	0.95MgTiO <sub>3</sub> -0.05CaTiO <sub>3</sub>	1450	Composite	21.0	56000	7	0	611
1449	5NiO-Nb <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1125	Mixture	21.0	8200	5.08	-64	230
1450	TbTiNbO <sub>6</sub>	1385	Aschenite Orthorhombic Pbcn	21.0	15700	7.58	-45	563
1451	5ZnO-2Nb <sub>2</sub> O <sub>5</sub>	1220	Mixed phases	21.0	88000	6.98	-73	325
1452	Sm <sub>0.6</sub> Y <sub>0.4</sub> TiNbO <sub>6</sub>	1400	Euxenite Orthorhombic Pbnm	21.0	11500		-4	564
1453	Ca <sub>5</sub> Ta <sub>2</sub> ZrO <sub>12</sub>	1700	Perovskite	21.0	23800	5.38	-27	662
1454	ZnTiO <sub>3</sub>	925	Trigonal R-3	21.0	30000		-90	663
1455	Ca[(Li <sub>0.33</sub> Nb <sub>0.67</sub> ) <sub>0.9</sub> Ti <sub>0.1</sub> ] O <sub>3-δ</sub> +20 wt% LiF	840	Composite	21.0	20400		-18	664
1456	Ba <sub>0.95</sub> (Zn <sub>1/2</sub> W <sub>1/2</sub> )O <sub>2.95</sub>	1250/4h	Cubic perovskite Fm3m	21.0	25000		-40	567
1457	NiNb <sub>2</sub> O <sub>6</sub>	1200	Columbite Pbcn	21.0	19300	6.5	-71	557
1458	Mg <sub>0.95</sub> Ca <sub>0.05</sub> TiO <sub>3</sub> +0.2 mol% Bi <sub>2</sub> O <sub>3</sub>	1250	Ilmenite Trigonal R-3	21.0	55600	7	-12	665
1459	0.96(Mg <sub>0.95</sub> Ni <sub>0.05</sub> )TiO <sub>3</sub> -0.04SrTiO <sub>3</sub>	1300/4h	Ilmenite Trigonal R-3	21.0	73000		1	666
1460	SrLa <sub>4</sub> Si <sub>3</sub> O <sub>13</sub> +8 wt% TiO <sub>2</sub>	1225/4h	Composite	21.0	13000		-10	253
1461	0.54BaWO <sub>4</sub> -0.46Ba <sub>5</sub> Nb <sub>4</sub> O <sub>15</sub>	1100	Composite	21.0	49500		9	485
1462	Mg <sub>1+0.01</sub> Nb <sub>2</sub> O <sub>6</sub>	1400	Columbite Pcan	21.0	121000	10	-60	644
1463	0.6Mg <sub>4</sub> Nb <sub>2</sub> O <sub>9</sub> -0.4SrTiO <sub>3</sub>	1300/4h	Composite	21.0	112000	9.7	2	667
1464	x(Mg <sub>0.96</sub> Co <sub>0.04</sub> )TiO <sub>3</sub> -(1-x)SrTiO <sub>3</sub> (x=0.94)	1360/6h	Composite	21.0	97000		2	668

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No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
1465	Nd(Mg <sub>0.5</sub> Sn <sub>0.4</sub> Ti <sub>0.1</sub> )O <sub>3</sub>	1550/4h	Perovskite	21.1	50000		-60	669
1466	(Sr <sub>1-x</sub> Ca <sub>x</sub> )Nd <sub>2</sub> Al <sub>2</sub> O <sub>7</sub> (x=0.5)		Ruddlesden-Popper solid solution	21.1	68200		0	670
1467	0.4BaTa <sub>2</sub> V <sub>2</sub> O <sub>11</sub> -0.6Ba <sub>2</sub> BiV <sub>3</sub> O <sub>11</sub>	885	Composite	21.1	44750		2	670b
1468	Ba[Ti <sub>1-x</sub> (Zn <sub>1/2</sub> W <sub>1/2</sub> ) <sub>x</sub> ]O <sub>3</sub> (x=0.6)	1420	Hexagonal P6 <sub>3</sub> /mmc perovskite	21.2	26800		-3	695
1469	Mg <sub>0.95</sub> Ca <sub>0.05</sub> TiO <sub>3</sub> +2 wt% B <sub>2</sub> O <sub>3</sub>	1200	Ilmenite Trigonal R-3	21.2	62000	8	4	615
1470	(1-x)MgTiO <sub>3</sub> -xCa <sub>0.8</sub> Sr <sub>0.2</sub> TiO <sub>3</sub> (x=0.06)	1300/4h	Composite	21.2	110900	9.3	-1	696
1471	Ca(Yb <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1500	Perovskite	21.2	24000	9.6	-38	590
1472	SmZrTaO <sub>6</sub>	1650		21.2	24190		-58	671
1473	CaTa <sub>2</sub> O <sub>6</sub>	1600	Cubic Pm3m	21.2	11600		1	600
1474	Sr(Co <sub>1/2</sub> W <sub>1/2</sub> )O <sub>3</sub>	1450	Perovskite Cubic Fm3m	21.2	14000	7.72	-73	528
1475	Li <sub>2</sub> Zn(Ti <sub>0.9</sub> Sn <sub>0.1</sub> ) <sub>3</sub> O <sub>8</sub> +1.5 wt% 0.4B <sub>2</sub> O <sub>3</sub> -0.6CuO	875	Cubic spinel	21.2	12000		-20	672
1476	Ca <sub>1-3x</sub> Bi <sub>2x</sub> A <sub>x</sub> )MoO <sub>4</sub> (x=0.15, A=A site vacancy)	700	Tetragonal Scheelite	21.2	29300		-1	673
1477	Ca[Li <sub>0.33</sub> Nb <sub>0.67</sub> ]O <sub>3-δ</sub> +20 wt% LiF	840	Perovskite	21.3	20450	4.59	-18	664
1478	ZnTiO <sub>3</sub> +1 wt% V <sub>2</sub> O <sub>5</sub>	900	Trigonal R-3	21.3	8000	8.8		591
1479	Nd(Ti <sub>1/2</sub> W <sub>1/2</sub> )O <sub>4</sub>	1285	Tetragonal Scheelite I4 <sub>1</sub> /a	21.3	10600	5.5	-22	400
1480	0.98CeO <sub>2</sub> -0.02CaTiO <sub>3</sub> +0.25 wt% B <sub>2</sub> O <sub>3</sub>	1380/4h	Fluorite Cubic Fm3m	21.3	60000	8	-41	674
1481	0.34BaMoO <sub>4</sub> -0.66TiO <sub>2</sub>	1300	Composite	21.3	20700		119	229
1482	(1-x)MgTiO <sub>3</sub> -xCa <sub>0.8</sub> Sr <sub>0.2</sub> TiO <sub>3</sub> (x=0.06)		Ilmenite Trigonal R-3	21.4	83700		-2	572
1483	PbWO <sub>4</sub>	620	Tetragonal	21.4	43000	7	-7	476
1484	CaHfO <sub>3</sub>	1750/6h	Orthorhombic perovskite Pnma	21.4	15950	8.9	-33	675
1485	Li <sub>2</sub> TiO <sub>3</sub> +5 wt% Li <sub>2</sub> O-MgO-B <sub>2</sub> O <sub>3</sub>	850	Monoclinic C2/c	21.4	64100		27	676
1486	(Rb,Bi) <sub>1/2</sub> MoO <sub>4</sub>	550	Scheelite Monoclinic P2 <sub>1</sub> /c	21.4	6200	7.5	-30	677
1487	CoLi <sub>2/3</sub> Ti <sub>4/3</sub> O <sub>4</sub>	1050	Cubic spinel Fd-3m	21.4	35000		-22	660
1488	0.5CeO <sub>2</sub> -0.25MgO-0.25TiO <sub>2</sub> : 1 WO <sub>3</sub>	1400	Mixture phases	21.4	90000	5.57	-50	488
1489	SrNdGaO <sub>4</sub>	1300/3h	Tetragonal I4/mmm	21.4	16600		7.1	638
1490	0.9ZnNb <sub>2</sub> O <sub>6</sub> -0.1(ZnO-V <sub>2</sub> O <sub>5</sub> )	950	Columbite Pbcn	21.4	29500			678
1491	MgNb <sub>2</sub> O <sub>6</sub>	1300	Columbite Orthorhombic Pcan	21.4	93800		-70	600

1492	MgTiO <sub>3</sub> -CaTiO <sub>3</sub> (MMT-20)	1360	Composite	21.4	26000	7		177
1493	0.5BaCaV <sub>2</sub> O <sub>7</sub> -0.5TiO <sub>2</sub>	950	Composite	21.4	14600		4	679
1494	0.95(Mg <sub>0.98</sub> Zn <sub>0.02</sub> )TiO <sub>3</sub> -0.05CaTiO <sub>3</sub> +4 wt% CBS glass	1240/2h	Composite	21.4	59200		-2	680
1495	Sm(Ti <sub>1/2</sub> W <sub>1/2</sub> )O <sub>4</sub>	1300	Tetragonal Scheelite	21.5	7100	5.5	-14	400
1496	BaO-0.32MgO-0.26WO <sub>3</sub> -0.42TiO <sub>2</sub>	1500/6h	Composite	21.5	49000		1	407
1497	MgNb <sub>2</sub> O <sub>6</sub> +0.25 wt% B <sub>2</sub> O <sub>3</sub>	1260/3h	Columbite Orthorhombic Pcan	21.5	115800		-48	681
1498	5Li <sub>2</sub> O-0.583Nb <sub>2</sub> O <sub>5</sub> -3.248TiO <sub>2</sub> +1 wt% V <sub>2</sub> O <sub>5</sub>	920	M phase	21.5	32950		6.1	682
1499	85 wt% Ba <sub>5</sub> Nb <sub>4</sub> O <sub>15</sub> +15 wt% Li <sub>2</sub> O-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -CaO-Al <sub>2</sub> O <sub>3</sub>	875	Composite	21.5	3400		-15	592
1500	NdAlO <sub>3</sub> +0.25 wt% V <sub>2</sub> O <sub>5</sub>	1410	Perovskite Trigonal R-3m	21.5	64000	9	-30	683
1501	ZnNb <sub>2</sub> O <sub>6</sub>	1200	Columbite Orthorhombic Pbcn	21.5	84500	6.3	-75	557
1502	Ba <sub>3</sub> MgSb <sub>2</sub> O <sub>9</sub>		Perovskite Hexagonal P6 <sub>3</sub> /mmc	21.5	23020	5.1	-6	381
1503	MgNb <sub>2</sub> O <sub>6</sub> +2 wt% CuO-B <sub>2</sub> O <sub>3</sub>	1050	Columbite Orthorhombic Pcan	21.5	108000		-44	684
1504	Zn <sub>3</sub> Nb <sub>2</sub> O <sub>8</sub>	1150/2h	Monoclinic C2/c	21.6	83300		-71	632
1505	PbWO <sub>4</sub>	850	Scheelite Tetragonal I4 <sub>1</sub> /a	21.6	34500		-22	49
1506	0.93(Mg <sub>0.95</sub> Co <sub>0.05</sub> )TiO <sub>3</sub> -0.07CaTiO <sub>3</sub>	1275/4h	Ilmenite Trigonal R-3	21.6	92000	7	-2	685
1507	Ba[Ti <sub>1-x</sub> (Ni <sub>1/2</sub> W <sub>1/2</sub> ) <sub>x</sub> ]O <sub>3</sub> (x=0.55)	1425	Perovskite	21.6	38400		-8	616
1508	0.93(Mg <sub>0.95</sub> Co <sub>0.05</sub> )TiO <sub>3</sub> -0.07Ca <sub>0.8</sub> Sr <sub>0.2</sub> TiO <sub>3</sub>	1275	Composite	21.6	98900		1	686
1509	SrSm <sub>2</sub> Al <sub>2</sub> O <sub>7</sub>		Tetragonal R-P phase	21.6	64700		4	538
1510	(Zn <sub>0.7</sub> Mg <sub>0.3</sub> )TiO <sub>3</sub> +1 wt% Li <sub>2</sub> O-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -CaO-Al <sub>2</sub> O <sub>3</sub> - glass	900	Mixture	21.6	62000		-60	687
1511	0.93Li <sub>2</sub> Mg <sub>2</sub> W <sub>2</sub> O <sub>9</sub> -0.07CaTiO <sub>3</sub>	920	Trigonal P-3c1 Corundum	21.6	20700		-1	688
1512	Mg <sub>0.95</sub> Ca <sub>0.05</sub> TiO <sub>3</sub> +0.5 mol%B <sub>2</sub> O <sub>3</sub>	1250	Ilmenite Trigonal R-3	21.7	52400	7	-29	665
1513	1-x(Mg <sub>0.95</sub> Ni <sub>0.05</sub> )TiO <sub>3</sub> -x(Ca <sub>0.8</sub> Sr <sub>0.2</sub> )TiO <sub>3</sub>	1275/4h	Composite	21.7	94000		5	689
1514	1-xCeO <sub>2</sub> -xEr <sub>2</sub> O <sub>3</sub> (x=0.15)	1650	Cubic Fluorite Fm3m	21.7	23000		-40	413
1515	SrNb <sub>2</sub> O <sub>6</sub>	1300	Columbite Monoclinic P2 <sub>1</sub> /c	21.7	16900	6.51	-	557
1516	(1-x)CeO <sub>2</sub> -xEr <sub>2</sub> O <sub>3</sub> (x=0.7)	1650	Cubic fluorite Fm3m	21.7	23000		-40	413

(continued)



No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
1517	CeO <sub>2</sub> +1 wt% CuO	1580	Cubic fluorite Fm3m	21.7	50000	9	-59	690
1518	0.9Mg <sub>0.95</sub> Co <sub>0.05</sub> TiO <sub>3</sub> - 0.1Ca <sub>0.6</sub> La <sub>0.8/3</sub> TiO <sub>3</sub> + 0.25 wt% V <sub>2</sub> O <sub>5</sub>	1250	Composite	21.7	58000	2.0	-10	691
1519	MgO-TiO <sub>2</sub> -ZnO-CaO+10 wt% Li <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub>	900	Composite	21.7	50000		-22	692
1520	MgTiO <sub>3</sub> -(K <sub>0.5</sub> La <sub>0.5</sub> )TiO <sub>3</sub> +0.5 wt% ZnO	1300/4h	Multiphase	21.7	68000	8	1	693
1521	0.56Ba(Mg <sub>1/2</sub> W <sub>1/2</sub> )O <sub>3</sub> -0.44BaTiO <sub>3</sub>	1500	Composite	21.8	13000		44	373
1522	0.9(Mg <sub>0.95</sub> Co <sub>0.05</sub> )TiO <sub>3</sub> - 0.1Ca <sub>0.6</sub> La <sub>0.8/3</sub> TiO <sub>3</sub>	1350/4h	Composite	21.8	131000	7	-16	694
1523	(Ca <sub>1+x</sub> Sm <sub>1-x</sub> )(Al <sub>1-x</sub> Ti <sub>x</sub> )O <sub>4</sub> (x=0.3)	1500	K <sub>2</sub> NiF <sub>4</sub> type Tetragonal I4/mmm	21.8	83100		10	554
1524	99 wt% BiSbO <sub>4</sub> +1 wt% CaTiO <sub>3</sub>	1100	Monoclinic I2/c	21.8	61150		-40	697
1525	0.94MgTiO <sub>3</sub> -0.06Ca <sub>0.8</sub> Sr <sub>0.2</sub> TiO <sub>3</sub>	1300	Composite	21.9	128000		-68	698
1526	Mg <sub>0.95</sub> Ca <sub>0.05</sub> TiO <sub>3</sub> +1 mol% Bi <sub>2</sub> O <sub>3</sub>	1250	Ilmenite Trigonal R-3	21.9	41100	7	0	665
1527	90 wt% CaZrO <sub>3</sub> +10 wt% Li <sub>2</sub> O-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub>	875	Composite	21.9	4700		-39	592
1528	Li <sub>3</sub> NbO <sub>4</sub> -0.15CaTiO <sub>3</sub>		Composite	21.9	24900		-58	699
1529	(Na <sub>0.5</sub> Bi <sub>0.5</sub> ) <sub>0.6</sub> Ca <sub>0.4</sub> MoO <sub>4</sub>	750	Tetragonal scheelite	21.9	20660		8	343
1530	Ca(Ca <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>3</sub>		Perovskite	22.0	22000	-	6	609
1531	Li <sub>2.081</sub> Ti <sub>0.676</sub> Nb <sub>0.243</sub> O <sub>3</sub> +0.5 wt% B <sub>2</sub> O <sub>3</sub>	880	M phase	22.0	32000		-41	700
1532	Sr(Ca <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>3</sub>		Complex perovskite Trigonal P-3m1	22.0	27300	7	10	701
1533	Ca(Ni <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>3</sub>		Complex perovskite	22.0	21000	-	-91	609
1534	CrNbO <sub>4</sub>	1300/5h	Tetragonal P4 <sub>2</sub> /mmm	22.0	4000	4	-80	53
1535	(Zn <sub>0.7</sub> Mg <sub>0.3</sub> )TiO <sub>3</sub>	950	Trigonal R-3	22.0	65000		-80	663
1536	Sr(Mg <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>3</sub>		Complex perovskite Hexagonal	22.0	5600	7	-50	701
1537	Y(Mg <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub>	1650/2h	Perovskite Cubic Fd3m	22.0	33700	10	-46	702
1538	NdGaO <sub>3</sub>		Perovskite Orthorhombic Pbnm	22.0	85000			703
1539	Sr <sub>4</sub> AlNbO <sub>8</sub>	1525		22.0	3700	10.25		562

1540	$(\text{Zn}_{0.3}\text{Co}_{0.7})\text{TiO}_3$	1150	Trigonal R-3	22.0	80000		-60	704
1541	$\text{DyTiNbO}_6$	1385	Aschenite Orthorhombic Pbcn	22.0	19100	7.76	-42	563
1542	$\text{YbTiNbO}_6$	1400	Aschenite Orthorhombic Pbcn	22.0	11000	7.4	-63	563
1543	$\text{Sm}_{0.71}\text{Y}_{0.29}\text{TiNbO}_6$	1400	Orthorhombic Pbnm	22.0	1400		-2	564
1544	$\text{Ca}_5\text{Nb}_2\text{HfO}_{12}$	1700	Perovskite	22.0	16000	5.4	-29	490
1545	$0.5\text{CeO}_2\text{-}0.25\text{ZnO}\text{-}0.25\text{TiO}_2\text{:}4\text{ Co}_3\text{O}_4$	1250	Mixed phases	22.0	32100	5.5	-48	490
1546	$\text{CeO}_2\text{-}0.5\text{CoO}\text{-}0.5\text{TiO}_2$	1200	Mixed phases	22.0	50000		-47	488
1547	$\text{CoNb}_2\text{O}_6$	1150	Columbite Orthorhombic Pbcn	22.0	41700	6.7	-66	489,600
1548	$\text{Zn}_{0.5}\text{Mg}_{0.5}\text{Nb}_2\text{O}_6$	1150	Columbite Pbcn	22.0	33100		-29	705
1549	$\text{Ca}_{1-x}\text{Bi}_x\text{W}_{1-x}\text{VxO}_4$ (x=0.3)	950/2h	Tetragonal Scheelite (I4 <sub>1</sub> /a)	22.0	16700		2	706
1550	$(1\text{-}x)(\text{Mg}_{0.95}\text{Zn}_{0.05})\text{TiO}_3\text{-}x\text{Ca}_{0.6}\text{La}_{0.8/3}\text{TiO}_3$ (x=0.1)	1320/4h	Composite	22.0	94000		-20	465
1551	$5\text{Li}_2\text{O}\text{-}0.58\text{Nb}_2\text{O}_5\text{-}3.23\text{TiO}_2\text{+}0.5\text{ wt\% B}_2\text{O}_3$	900	M phase	22.0	32000		10	707
1552	$(1\text{-}x)(\text{Mg}_{0.95}\text{Ni}_{0.05})\text{TiO}_3\text{-}x\text{Ca}_{0.6}\text{La}_{0.8/3}\text{TiO}_3$ (x=0.1)	1325	Composite	22.0	118000		-25	708
1553	$\text{Li}_2\text{TiO}_3$		Monoclinic rocksalt C2/c	22.0	63500		20	709
1554	$\text{Li}_2\text{TiO}_3\text{+}20\text{ vol\% Li}_2\text{Zn}_3\text{Ti}_4\text{O}_{12}$	900	Composite	22.0	28400		-2	710
1555	$\text{NdAlO}_3$		Perovskite Trigonal R-3m	22.0	58000		-35	711
1556	$\text{ZnNb}_2\text{O}_6\text{+}10\text{ wt\% V}_2\text{O}_5$	900/2h	Columbite Orthorhombic Pnca	22.1	10300		-83	712,713
1557	$\text{La}_{2-x/3}\text{Na}_x(\text{Mg}_{1/2}\text{W}_{1/2})\text{O}_3$ (x=0.4)	1450	Perovskite Composite	22.1	5500		-45	655
1558	$\text{YTiTaO}_6$	1625	Euxenite Orthorhombic	22.1	51400		-20	583
1559	$0.6(\text{Al}_{1/2}\text{Ta}_{1/2})\text{O}_2\text{-}0.4(\text{Mg}_{1/2}\text{Ta}_{2/3})\text{O}_2$	1450	Orthorhombic Pbcn	22.1	90930		-16	214
1560	$0.92(\text{Mg}_{0.95}\text{Co}_{0.05})\text{TiO}_3\text{-}0.08\text{CaTiO}_3$	1275/4h	Composite	22.1	86400	7	5.4	422
1561	$\text{Nd}_2\text{BaCuO}_5$		Tetragonal I4/mcm	22.1	4910		4.6	463
1562	$\text{Nd}_2\text{Ba}(\text{Zn}_{1-x}\text{Cu}_x)\text{O}_5$ (x=0.15)		Tetragonal I4/mcm	22.1	7700	2		463
1563	$\text{ZnNb}_2\text{O}_6\text{+}5\text{ wt\% CuO}$	925/2h	Columbite Orthorhombic Pbcn	22.1	59500		-65	482
1564	$\text{Ba}(\text{Yb}_{1/2}\text{Ta}_{1/2})\text{O}_3$	1700	Perovskite Cubic Fm3m	22.1	14000	6.7	89	590
1565	$\text{Sm}_2\text{Ba}_{0.95}\text{Sr}_{0.05}\text{ZnO}_5$		Orthorhombic	22.1	10000		30	549
1566	$\text{Li}_2\text{TiO}_3$		Monoclinic rocksalt C2/c	22.1	63500		20	714

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
1567	Bi[Sb <sub>1-x</sub> (Nb <sub>0.992</sub> V <sub>0.008</sub> ) <sub>x</sub> ]O <sub>4</sub> (x=0.05)		Monoclinic I2/c	22.1	41000		-54	715
1568	Ca <sub>1-x</sub> Bi <sub>x</sub> W <sub>1-x</sub> V <sub>x</sub> O <sub>4</sub> (x=0.3)	950/2h		22.1	16700		2	706
1569	(1-x)Li <sub>3</sub> Bi <sub>2</sub> P <sub>3</sub> O <sub>12</sub> -xTiO <sub>2</sub> (x=0.55)	725	Monoclinic P2 <sub>1</sub> /m	22.1	14900		-3	456
1570	La <sub>3</sub> Ti <sub>5</sub> Al <sub>15</sub> O <sub>37</sub>	1420	Monoclinic Cc	22.1	57100		19	455
1571	(1-x)(Mg(Sn <sub>0.05</sub> Ti <sub>9.5</sub> )O <sub>3</sub> -x(Ca <sub>0.8</sub> Sr <sub>0.2</sub> ) TiO <sub>3</sub> -ywt% ZnNb <sub>2</sub> O <sub>6</sub> (x=0.7, y=4)	1320/2h	Composite	22.1	60600	7	0	716
1572	0.95MgTiO <sub>3</sub> -0.05(Ca <sub>0.8</sub> Sr <sub>0.2</sub> ) (Zr <sub>0.1</sub> Ti <sub>0.9</sub> )O <sub>3</sub>	1300/4h	Composite		116000		5	717
1573	ZnTiO <sub>3</sub> +5 wt% B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub>	850	Composite	22.2	52460	6		718
1574	Mg <sub>0.93</sub> Ca <sub>0.07</sub> TiO <sub>3</sub>	1350/3h	IlmeniteTrigonal R-3	22.2	68550		6	719
1575	Gd(Ti <sub>1/2</sub> W <sub>1/2</sub> )O <sub>4</sub>	1375	Tetragonal Scheelite	22.2	5000	5.5	-16	400
1576	Mg <sub>0.95</sub> Ca <sub>0.05</sub> TiO <sub>3</sub> +5 mol%B <sub>2</sub> O <sub>3</sub>	1250	Ilmenite Trigonal R-3	22.3	22500	7	-110	665
1577	NdAlO <sub>3</sub>	1650/2h	Perovskite Trigonal R-3m	22.3	58000	10	-33	452
1578	Sr <sub>3</sub> Zn <sub>0.5</sub> Mg <sub>0.5</sub> Nb <sub>2</sub> O <sub>9</sub>	1300	Trigonal, complex perovskite P-3m1	22.3	8200		4	614
1579	Nd <sub>2</sub> BaZn <sub>0.95</sub> Cu <sub>0.05</sub> O <sub>5</sub>	1250/10h	Tetragonal I4/mcm	22.4	6340		2	463
1580	NdAlO <sub>3</sub> +0.25 wt% CuO	1420/2h	Trigonal R-3m	22.4	63000	10	-35	720
1581	MnNb <sub>2</sub> O <sub>6</sub>	1150	Columbite orthorhombic Pbcn	22.4	34300		-60	600
1582	0.5CeO <sub>2</sub> -0.25MgO-0.25TiO <sub>2</sub>	1400	Mixture phases	22.4	17500	5.5	-62	488
1583	Zn <sub>3</sub> Nb <sub>2</sub> O <sub>8</sub> +2 mol% V <sub>2</sub> O <sub>5</sub>	850-1000	Monoclinic C2/c	22.4	67500			712
1584	CeO <sub>2</sub> +10 wt% Bi <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub> -ZnO-SiO <sub>2</sub>	950	Cubic fluorite Fm3m	22.4	12000	4.5	-57	401
1585	LaLuO <sub>3</sub>	1525	Orthorhombic Pnma	22.4	14400		-7.5	721
1586	(1-y)Li <sub>2.02</sub> Ti <sub>0.92</sub> Nb <sub>0.06</sub> O <sub>3</sub> (y=0.2)	1070	M phase	22.5	13600		14	722
1587	0.91(Mg <sub>0.7</sub> Zn <sub>0.03</sub> )TiO <sub>3</sub> -0.09CaTiO <sub>3</sub>	1310/3h	Ilmenite trigonal R-3	22.5	86000	7.5	3	723
1588	Zn <sub>1+0.005</sub> Nb <sub>2</sub> O <sub>6</sub>	1300	Pbcn Columbite	22.5	122000	70	-75	644
1589	ZnO-B <sub>2</sub> O <sub>3</sub> -P <sub>2</sub> O <sub>5</sub> -TeO <sub>2</sub> glass		Glass	22.5	1500	7	-100	318
1590	0.95(Mg <sub>0.7</sub> Zn <sub>0.3</sub> ) <sub>0.95</sub> Co <sub>0.05</sub> TiO <sub>3</sub> - 0.05Ca <sub>0.8</sub> Sr <sub>0.2</sub> TiO <sub>3</sub>	1150	Composite	22.5	90000	9	0	724
1591	0.9(Mg <sub>0.95</sub> Co <sub>0.05</sub> )TiO <sub>3</sub> - 0.1Ca <sub>0.8</sub> Sm <sub>0.4/3</sub> TiO <sub>3</sub>	1275	Composite	22.5	108000	8	-8	725

1592	0.75ZnNb <sub>2</sub> O <sub>6</sub> -0.25TiO <sub>2</sub>	1200	Columbite-Orthorhombic Pnca	22.5	15000		-15	545
1593	0.91(Mg <sub>0.7</sub> Zn <sub>0.3</sub> )TiO <sub>3</sub> -0.09CaTiO <sub>3</sub>	1310/3h	Composite	22.5	86000	7.5	3	726
1594	La <sub>5/3</sub> MgTaO <sub>6</sub>	1500/6h	Perovskite	22.5	5000	7.2	-80	727
1595	0.95(Mg <sub>0.95</sub> Zn <sub>0.05</sub> )TiO <sub>3</sub> -0.05CaTiO <sub>3</sub> +1 Mol% LaAlO <sub>3</sub>	1200/4h	Mixture	22.6	89000		-7	728
1596	NiNb <sub>2</sub> O <sub>6</sub>	1150	Columbite Orthorhombic Pbcn	22.6	40100		-38	729
1597	Nd <sub>2</sub> BaZnO <sub>5</sub>		Tetragonal I4/mcm	22.6	12451	8.9	4.6	730
1598	La <sub>2-x/3</sub> Na <sub>x</sub> (Mg <sub>1/2</sub> W <sub>1/2</sub> )O <sub>3</sub> (x=0.1)	1400	Perovskite	22.6	19700		-34	655
1599	La <sub>2-x/3</sub> Na <sub>x</sub> (Mg <sub>1/2</sub> W <sub>1/2</sub> )O <sub>3</sub> (x=0.2)	1400	Perovskite	22.6	16600		-27	655
1600	0.94MgTiO <sub>3</sub> -0.06CaTiO <sub>3</sub> +0.2 mol% Bi <sub>2</sub> O <sub>3</sub>	1250	Ilmenite Trigonal R-3	22.6	53000	7	-3	665
1601	0.95MgLi <sub>2/3</sub> Ti <sub>4/3</sub> O <sub>4</sub> -0.05CaTiO <sub>3</sub>	1200/2h	Composite	22.6	48000		-2	637
1602	0.93(Mg <sub>0.95</sub> Zn <sub>0.05</sub> )TiO <sub>3</sub> -0.07CaTiO <sub>3</sub>	1300/4h	Composite	22.6	93000	10	-3	731
1603	0.7Mg <sub>0.95</sub> Co <sub>0.05</sub> TiO <sub>3</sub> -0.3Zn <sub>0.975</sub> Ca <sub>0.025</sub> TiO <sub>3</sub>	1200	Composite	22.6	57000		0	732
1604	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>1-x</sub> Sn <sub>x</sub> ]O <sub>3</sub> (x=0.3)	1150	Perovskite Orthorhombic	22.6	46300		-39	733
1605	0.5ZnNb <sub>2</sub> O <sub>6</sub> -0.5Zn <sub>3</sub> Nb <sub>2</sub> O <sub>8</sub>	1200	Orthorhombic (mixture)	22.7	95500		-65	542
1606	0.9(Mg <sub>0.95</sub> Zn <sub>0.05</sub> Ti)O <sub>3</sub> -0.1Ca <sub>0.8</sub> Sm <sub>0.4/3</sub> TiO <sub>3</sub>	1300	Composite	22.7	124000		-6	734
1607	0.93(Mg <sub>0.95</sub> Mn <sub>0.05</sub> )TiO <sub>3</sub> -0.07CaTiO <sub>3</sub>	1270/4h	Composite	22.7	90700		0.8	735
1608	(1-x)MgTiO <sub>3</sub> -xCa <sub>0.8</sub> Sr <sub>0.2</sub> TiO <sub>3</sub> (x=0.08)		Composite	22.7	72400		14	572
1609	0.9(Mg <sub>0.95</sub> Co <sub>0.05</sub> TiO <sub>3</sub> -0.1Ca <sub>0.6</sub> La <sub>0.8/3</sub> TiO <sub>3</sub>	1225	Composite	22.7	76000		-12	736
1610	BiCu <sub>2</sub> VO <sub>6</sub>	740	Monoclinic P2 <sub>1</sub> /n	22.7	12000	11	-17	737
1611	0.45TiO <sub>2</sub> -0.55CeTe <sub>2</sub> O <sub>6</sub>	700	Composite	22.8	8300		25	434
1612	Li <sub>2</sub> ZnTi <sub>3</sub> O <sub>8</sub> +5 wt% LMZBS	900	Ternary spinel Cubic P4332	22.8	25000		-17	738
1613	LaAlO <sub>3</sub> +10 mol% Sr <sub>2</sub> Nb <sub>2</sub> O <sub>7</sub>	1575/3h	Composite	22.8	18610	7.6	46	739
1614	CoNb <sub>2</sub> O <sub>6</sub>	1100	Columbite Pbcn	22.8	93800		-45	600
1615	0.92CoNb <sub>2</sub> O <sub>6</sub> -0.08TiO <sub>2</sub>	1150	Columbite Orthorhombic Pnca	22.8	29000		-12	545
1616	La <sub>2-x/3</sub> Na <sub>x</sub> (Mg <sub>1/2</sub> W <sub>1/2</sub> )O <sub>3</sub> (x=0.3)		Perovskite	22.8	11500		45	655

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
1617	CeO <sub>2</sub> :1 mol% Nd <sub>2</sub> O <sub>3</sub>	1650	Cubic fluorite Fm3m	22.8	51000		-63	525
1618	Li <sub>2.08</sub> TiO <sub>3</sub> +0.13LiF	900/2h	Monoclinic Rock salt C2/c	22.8	63000		1	740
1619	0.89MgTiO <sub>3</sub> -0.11(Ca <sub>0.6</sub> Na <sub>0.2</sub> Sm <sub>0.2</sub> )TiO <sub>3</sub>	1250	Mixture	22.8	76000	8	-3	741
1620	Zn(Nb <sub>0.95</sub> Ta <sub>0.05</sub> ) <sub>2</sub> O <sub>6</sub> +4.5 wt% CuO	930	Columbite Orthorhombic Pnca	22.9	77200		-71	742
1621	Ba[Ti <sub>1-x</sub> (Zn <sub>1/2</sub> W <sub>1/2</sub> ) <sub>x</sub> ]O <sub>3</sub> (x=0.55)	1420	Hexagonal perovskite P6 <sub>3</sub> /mmc	22.9	15200		-1	665
1622	0.9(Mg <sub>0.95</sub> Ni <sub>0.05</sub> )TiO <sub>3</sub> - 0.1Ca <sub>0.8</sub> Sm <sub>0.4/3</sub> TiO <sub>3</sub>	1275/4h	Composite	22.9	92000		-5	743
1623	(Ca <sub>1+x</sub> Sm <sub>1-x</sub> )(Al <sub>1-x</sub> Ti <sub>x</sub> )O <sub>4</sub> (x=0.4)	1400	K <sub>2</sub> NiF <sub>4</sub> type Tetragonal I4/mmm	22.9	49100		15	554
1624	0.7Li <sub>2</sub> TiO <sub>3</sub> -0.3ZnO		Composite	23.0	99800	8.91	0	744
1625	Nd <sub>2</sub> O <sub>3</sub> -TiO <sub>2</sub> +BaO-SiO <sub>2</sub> -B <sub>2</sub> O <sub>3</sub> -ZnO-SrO glass	900	Glass	23.0	600			745
1626	Sm <sub>2</sub> O <sub>3</sub>	1650/2h	Monoclinic C2/m	23.0	46000		22	525
1627	(Zn <sub>0.65</sub> Mg <sub>0.35</sub> )TiO <sub>3</sub> +1.5 wt% BiVO <sub>4</sub> +5 wt% CaTiO <sub>3</sub>	930	Composite	23.0	16200		1	746
1628	Ca(Cu <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>3</sub>		Complex perovskite	23.0	5500	-	-	609
1629	0.93MgTiO <sub>3</sub> -0.07CaTiO <sub>3</sub> (SPS sintering)	1150/ 10 min	Composite	23.0	7000		-	747
1630	Ca(Co <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>3</sub>		Complex perovskite	23.0	12000	-	-65	609,701
1631	Ba <sub>0.99</sub> (Zn <sub>1/2</sub> W <sub>1/2</sub> )O <sub>2.99</sub>	1250/4h	Cubic perovskite Fm3m	23.0	22000		-35	567
1632	Sr(Ni <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>3</sub>		Complex perovskite Trigonal P-3m1	23.0	49000	7	-18	701
1633	Sr(Co <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>3</sub>		Complex perovskite Trigonal P-3m1	23.0	17500	7	-71	701
1634	Ba(Ni <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>3</sub>		Complex perovskite Trigonal P-3m1	23.0	49700	7	-18	701
1635	La(Co <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub>		Perovskite	23.0	32000		-57	748
1636	Dy(Mg <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub>	1650/2h	Perovskite	23.0	36800	10	-6	702
1637	0.7MgTiO <sub>3</sub> -0.3MgTa <sub>2</sub> O <sub>6</sub>	1460/3h	Mixed phases	23.0	81000		-2	749
1638	Ca(La <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1600/4h	Complex perovskite Monoclinic P2 <sub>1</sub> /n	23.0	20600		-32	750

1639	CaTiO <sub>3</sub> -CaZrO <sub>3</sub> +frit glass (70:15:15)	875	Composite	23.0	2400		0	196
1640	Sm <sub>2</sub> Ba <sub>0.9</sub> Sr <sub>0.1</sub> ZnO <sub>5</sub>		Tetragonal	23.0	8520		36	549
1641	CeO <sub>2</sub> -CoO <sub>4</sub> -TiO <sub>2</sub> +0.5 wt% CuO	1050	Mixture	23.0	45000		-55	366
1642	CaO-4NiO-Ta <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1340	Mixture	23.0	8500	5.5	-48	230
1643	CoNb <sub>2</sub> O <sub>6</sub>	1150	Columbite Orthorhombic Pbcn	23.0	40000		-35	729
1644	0.4(0.5ZnNb <sub>2</sub> O <sub>6</sub> -0.5Zn <sub>3</sub> Nb <sub>2</sub> O <sub>8</sub> )- 0.6ZnTa <sub>2</sub> O <sub>6</sub>	1275	Composite	23.0	9300		-55	542
1645	CaO-4MgO-Nb <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1340	Mixture	23.0	52000	5.5	-30	230
1646	2CaO-3ZnO-Nb <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1140	Mixture	23.0	15000	5.5	-34	230
1647	Nd(Mg <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub>	1650/2h	Perovskite	23.0	36900	10	-49	702
1648	Li <sub>2</sub> MgTi <sub>3</sub> O <sub>8</sub>	1100/5h	Cubic spinel P4 <sub>3</sub> 32	23.0	54050	7.29	2	751
1649	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>1-x</sub> Sn <sub>x</sub> ]O <sub>3-δ</sub> (x=0.3)	1150/3h	Perovskite	23.0	46300		-39	752
1650	0.93(Mg <sub>0.6</sub> Zn <sub>0.4</sub> ) <sub>0.95</sub> Co <sub>0.05</sub> TiO <sub>3</sub> -0.07 CaTiO <sub>3</sub>	1200	Composite	23.0	79400		1	753
1651	0.93MgTiO <sub>3</sub> -0.07CaTiO <sub>3</sub> SPS method	1150/ 10 min	Ilmenite+Perovskite	23.0	70000			754
1652	CeO <sub>2</sub>	1675	Cubic fluorite Fm3m	23.0	65000		-55	640
1653	Li <sub>2</sub> TiO <sub>3</sub> +2 wt% ZnO-B <sub>2</sub> O <sub>3</sub> frit+0.9 wt% CeO <sub>2</sub>	920/4h	Composite	23.0	34900		33	755
1654	HoTiTaO <sub>6</sub>	1550	Euxenite Orthorhombic	23.1	46900		-8	583
1655	Nd <sub>1.95</sub> La <sub>0.5</sub> BaZnO <sub>5</sub>		Orthorhombic Pnma	23.1	7165		2	599
1656	Li <sub>2</sub> TiO <sub>3</sub> +2.5 wt% ZnO-B <sub>2</sub> O <sub>3</sub>	900/2h	Monoclinic C2/c	23.1	32300		36	756
1657	Ba <sub>5</sub> Li <sub>2</sub> W <sub>3</sub> O <sub>13</sub> +4 wt% BaCu(B <sub>2</sub> O <sub>5</sub> )	900	Hexagonal Perovskite	23.1	34300		4	757
1658	Li <sub>2</sub> ZnTi <sub>3</sub> O <sub>8</sub> +3 wt% LMZBS	900	Cubic P4 <sub>3</sub> 32	23.2	31300		-16	738
1659	0.87(Mg <sub>0.95</sub> Ni <sub>0.05</sub> )TiO <sub>3</sub> - 0.13(La <sub>0.5</sub> Na <sub>0.5</sub> )TiO <sub>3</sub>	1275/4h	Composite	23.2	86500		3	758
1660	Li <sub>2.08</sub> TiO <sub>3</sub> (sol-gel)	1050	Monoclinic C2/c	23.2	56400		38	759
1661	PrAlO <sub>3</sub>	1650/2h	Perovskite Trigonal R-3m	23.2	51000	10	-25	452
1662	ZnNb <sub>2</sub> O <sub>6</sub>	1200	Columbite Orthorhombic Pnca	23.2	84500	6.3	-76	557
1663	Li <sub>2</sub> TiO <sub>3</sub> +2 wt% Li <sub>2</sub> O-ZnO-B <sub>2</sub> O <sub>3</sub>	900	Monoclinic C2/c	23.2	38900		30	652

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
1664	$0.2(\text{LiNb}_{0.8}\text{Ti}_{0.5}\text{O}_3)+0.8(\text{Li}_{2.02}\text{Nb}_{0.06}\text{Ti}_{0.92})\text{O}_3$	1100	Composite	23.2	14900		14	760
1665	$\text{Na}_2\text{BiMg}_2\text{V}_3\text{O}_{12}$	660/4h	Cubic garnet	23.2	3700		8	761
1666	$0.87\text{Li}_2\text{TiO}_3-0.05\text{MgO}-0.08\text{LiF}$	950	Composite	23.2	131700		0	762
1667	$\text{Zn}(\text{Nb}_{1-x}\text{V}_{x/2})_2\text{O}_{6-2.5x}$ ( $x=0.15$ )	975/2h	Columbite Orthorhombic Pbcn	23.3	37000		-71	712
1668	$\text{Ca}[(\text{Li}_{1/3}\text{Nb}_{2/3})_{1-x}\text{Sn}_x]\text{O}_3$ ( $x=0.2$ )	1150/3h	Perovskite	23.3	50600		-30	752
1669	$\text{Ca}(\text{La}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1550/4h	Perovskite Monoclinic	23.3	31000		-43	763
1670	$\text{ZnNb}_2\text{O}_6+5 \text{ wt}\% \text{ CuO}+4\text{B}_2\text{O}_3$	900	Columbite Orthorhombic Pnca	23.3	46800		-7	764
1671	$\text{Ca}(\text{Li}_{1/3}\text{Ta}_{2/3})\text{O}_3-\delta+6 \text{ wt}\% \text{ B}_2\text{O}_3$	1100	Perovskite	23.3	27900	10.99		765
1672	$\text{Ba}_2\text{Ca}_{1-x}\text{Sr}_x\text{WO}_6$ ( $x=0.5$ )	1200	Perovskite Cubic Fm3m	23.3	45200		-14	766
1673	$\text{Li}_2\text{Zn}(\text{Ti}_{0.9}\text{Sn}_{0.1})_3\text{O}_8$	1120	Cubic spinel	23.3	71000		-22	672
1674	$\text{ZnNb}_2\text{O}_6+1 \text{ wt}\% \text{ V}_2\text{O}_5+1 \text{ wt}\% \text{ Bi}_2\text{O}_3+2.5 \text{ wt}\% \text{ CuO}$	880	Columbite Orthorhombic Pnca	23.4	47000		-45	767
1675	$0.88(\text{Mg}_{0.95}\text{Zn}_{0.05})\text{TiO}_3-0.12(\text{Na}_{0.5}\text{La}_{0.5})\text{TiO}_3$		Composite	23.4	103000	9	1	768
1676	$\text{LaAlO}_3+5 \text{ mol}\% \text{ Sr}_2\text{Nb}_2\text{O}_7$	1575/3h	Composite	23.4	20790	10.81	-25	769
1677	$\text{LaAlO}_3$	1650/2h	Perovskite Hexagonal R-3m	23.4	68000	10	-44	452
1678	$\text{CeO}_2:1 \text{ mol}\% \text{ Er}_2\text{O}_3$	1650	Cubic fluorite Fm3m	23.5	74000		-60	525
1679	$\text{La}_6\text{Mg}_4\text{Ta}_2\text{W}_2\text{O}_{24}$	1350/4h	$\text{A}_{1-d}\text{BO}_3$ perovskite Monoclinic	23.5	13600	5.4	-46	770
1680	$0.96(\text{Mg}_{0.6}\text{Zn}_{0.4})_{0.95}\text{Co}_{0.05}\text{TiO}_3-0.04\text{SrTiO}_3$	1250	Mixture phases	23.5	92000		-2	771
1681	$\text{SrHfO}_3$	1750/6h	Orthorhombic perovskite Pnma	23.5	33500	9.3	-63	675
1682	$\text{Ba}_2\text{Ca}_{1-x}\text{Sr}_x\text{WO}_6$ ( $x=0.1$ )	1200	Perovskite Cubic Fm3m	23.5	60100		-16	766
1683	$0.3\text{Li}_2\text{TiO}_3-0.7\text{Li}(\text{Zn}_{0.5}\text{Ti}_{0.5})\text{O}_4$	1100	Composite	23.5	88360		0	772
1684	$\text{Ba}(\text{Mg}_{0.33}\text{Ta}_{0.53}\text{Ti}_{0.067}\text{W}_{0.067})\text{O}_3$	1590	Perovskite	23.6	75900	5.7	-3	438
1685	$\text{La}_{2/3}(\text{Mg}_{1/2}\text{W}_{1/2})\text{O}_3$	1250	Orthorhombic I222	23.6	32500		-43	655,773
1686	$(1-x)\text{Li}_2\text{TiO}_3+x\text{LiF}$ ( $x=0.1$ )	1100/2h	Composite	23.6	10800		4	774
1687	$\text{La}_{2/3}(\text{Mg}_{1/2}\text{W}_{1/2})\text{O}_3+2 \text{ mol}\% \text{ TiO}_2$	1330	Orthorhombic I222	23.6	14800		-10	775
1688	$\text{Zn}_{0.95}\text{Mg}_{0.05}\text{TiO}_3+0.25 \text{ TiO}_2+1 \text{ wt}\% 3\text{ZnO-B}_2\text{O}_3$	940/2h	Composite	23.6	30990	7.75	-8	776

1689	$\text{Sr}_{1-x}\text{Nd}_x\text{Al}_{1-x}\text{Ti}_x\text{O}_4$ ( $x=0.6$ )		Tetragonal I4/mmm	23.6	86300		11	777
1690	$(\text{Ni}_{1-x}\text{Zn}_x)\text{Nb}_2\text{O}_6$ ( $x=0.2$ )	1300	Columbite Orthorhombic Pbcn	23.6	18900		-62	778
1691	$(\text{Zn}_{1-x}\text{Mg}_x)\text{Nb}_2\text{O}_6$	1150-1350	Columbite Orthorhombic Pnca	23.6-19.2	81220-33110		-71 to -29	705
1692	$\text{SrLa}_2\text{Mg}_2\text{W}_2\text{O}_{12}$	1525	Orthorhombic	23.7	15900		0	645
1693	$\text{Li}_2\text{MgTi}_3\text{O}_8$ +5 wt% LMZBS	925	Ternary spinel Cubic P4 <sub>3</sub> 32	23.7	38000		0	738
1694	$(1-x)\text{Li}_3\text{Bi}_2\text{P}_3\text{O}_{12-x}\text{TiO}_2$ ( $x=0.6$ )	760	Monoclinic P2 <sub>1</sub> /m	23.8	15300		23	456
1695	$\text{CaZrO}_3$ (nanopowder)	1500/4h	Perovskite Pbnm	23.8	30600	5.65	1.4	779
1696	$\text{Zn}(\text{Nb}_{1-x}\text{V}_{x/2})_2\text{O}_{6-2.5x}$ ( $x=0.025$ )	1000/2h	Columbite Orthorhombic Pnca	23.8	64000		-50	712
1697	$\text{Zn}_{1+x}\text{Nb}_2\text{O}_6$ ( $x=0.01$ )	1250	Columbite Orthorhombic Pnca	23.8	120000		-73	780
1698	$\text{NiZrNb}_2\text{O}_8$	1200	Monoclinic Wolframite P2/c	23.8	40300		-28	781
1699	$\text{MgZrNb}_2\text{O}_8$ +1 wt% $\text{H}_3\text{BO}_3$	1200/4h	Monoclinic P2/c	23.8	58900		-13	782
1700	$\text{Zn}(\text{Nb}_{0.94}\text{V}_{0.06})_2\text{O}_6$	875/2h	Columbite Orthorhombic Pbcn	23.9	65000		-73	713
1701	$\text{CeO}_2$ :1 mol% $\text{Sm}_2\text{O}_3$	1650	Cubic fluorite Fm3m	23.9	90000		-50	525
1702	$\text{Sr}_2\text{La}_2\text{MgW}_2\text{O}_{12}$	1525	Orthorhombic	23.9	35000		-83	645
1703	$\text{Ba}_2\text{Ca}_{0.975}\text{Sr}_{0.025}\text{WO}_6$	1250	Perovskite Cubic Fm3m	23.9	80200		18	766
1704	$\text{Ba}_2\text{Ca}_{1-x}\text{Sr}_x\text{WO}_6$ ( $x=0.05$ )	1225	Perovskite Cubic Fm3m	24.0	77800		-20	766
1705	$\text{Ba}[\text{Ti}_{1-x}(\text{Co}_{0.5}\text{W}_{0.5})_x\text{O}_3]$ ( $x=0.9$ )	1425	Perovskite	24.0	20700		-18	519
1706	$\text{Ba}_{0.98}(\text{Zn}_{1/2}\text{W}_{1/2})\text{O}_{2.98}$	1250/4h	Cubic perovskite Fm3m	24.0	31000		-40	567
1707	$0.85(\text{Mg}_{0.95}\text{Ni}_{0.05})\text{TiO}_3$ - $0.15\text{Ca}_{0.61}\text{Nd}_{0.26}\text{TiO}_3$	1350	Composite	24.0	67000		-9	783
1708	$\text{Li}_2\text{TiO}_3$ +2.5 wt% LiF	950	Monoclinic C2/c	24.0	75500		36	784
1709	$\text{CeO}_2$ : 1mol% CaO	1675	Cubic fluorite Fm3m	24.0	120000	5.48	-60	640
1710	$\text{CeO}_2$ +1 mol% $\text{Sm}_2\text{O}_3$	1650/2h	Cubic fluorite Fm3m	24.0	90000		-50	525
1711	$2\text{CaO}$ - $3\text{CoO}$ - $\text{Ta}_2\text{O}_5$ - $\text{TiO}_2$	1260	Mixture	24.0	13500	5.3	-19	230
1712	$\text{Ba}_8\text{Ta}_6\text{Ni}_{0.25}\text{Mg}_{0.75}\text{O}_{24}$			24.0	93000		25	785
1713	$\text{Ca}(\text{Li}_{1/3}\text{Ta}_{2/3})\text{O}_3$ - $\delta$	1200	Perovskite	24.0	42300	10.8		765
1714	$\text{BaO}$ - $\text{TiO}_2$ - $\text{WO}_3$ +5 wt% $\text{ZnO}$ - $2\text{B}_2\text{O}_3$	1100	Composite	24.0	13000	9.4		786
1715	$\text{BaO}$ - $0.32\text{MgO}$ - $0.25\text{WO}_3$ - $0.43\text{TiO}_2$	1500/6h	Composite	24.0	19500		34	407
1716	$\text{Ba}(\text{Mg}_{1/3}\text{Ta}_{2/3})\text{O}_3$	1640/20h	Complex perovskite Trigonal P-3m1	24.0	430000	10	5	787

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No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
1717	$\text{Ca}(\text{In}_{1/2}\text{Ta}_{1/2})\text{O}_3$	1600/4h	Complex perovskite Monoclinic $\text{P2}_1/\text{n}$	24.0	16700		-35	750
1718	$\text{Ca}(\text{Pr}_{1/2}\text{Ta}_{1/2})\text{O}_3$	1600/4h	Complex perovskite Monoclinic $\text{P2}_1/\text{n}$	24.0	22200		-31	750
1719	$\text{LiNb}_3\text{O}_8$	1075	$\alpha$ - $\text{PbO}_2$ type Monoclinic $\text{P2}_1/\text{a}$	24.0	58000		-96	788
1720	$\text{Nd}_{0.3}\text{Dy}_{0.7}\text{TiNbO}_6$			24.0	27750		-22	564
1721	$\text{Ca}(\text{Li}_{1/3}\text{Ta}_{2/3})\text{O}_3$ - $\delta$ +3 wt% $\text{B}_2\text{O}_3$	1100	Perovskite	24.0	40300	10.86		765
1722	$(\text{Zn}_{0.3}\text{Co}_{0.7})\text{Ti}_{1-x}\text{Sn}_x\text{O}_3$ ( $x=0.02$ )	1220/4h	Cubic spinel+rutile	24.0	66700		-5	789
1723	$0.75(\text{Al}_{1/2}\text{Ta}_{1/2})\text{O}_2$ - $0.25(\text{Ti}_{1-x}\text{Sn}_x)\text{O}_2$	1450/3h	Tetragonal $\text{TiO}_2$ type	24-30	55000-80000		-25 to 15	790
1724	$0.85\text{Ba}(\text{Mg}_{1/3}\text{Ta}_{2/3})\text{O}_3$ - $0.15\text{BaSnO}_3$	1640/20h	Complex perovskite Trigonal $\text{P-3m1}$	24.0	330000		-1	791
1725	$\text{La}_{3/4}\text{Mg}_{2/4}\text{Ta}_{1/4}\text{W}_{1/4}\text{O}_3$	1350/4h		24.0	13600		-46	770
1726	$\text{La}_{2/3}(\text{Mg}_{1/2}\text{W}_{1/2})\text{O}_3$ +2 mol% $\text{TiO}_2$		Orthorhombic I222	24.0	14800	6	10	775
1727	$\text{Sm}_2\text{SrZnO}_5$		Tetragonal	24.1	19283	8.1	-97	549
1728	$\text{Ca}(\text{Li}_{1/3}\text{Ta}_{2/3})\text{O}_3$ - $\delta$ +1 wt% $\text{B}_2\text{O}_3$	1100	Perovskite	24.1	38900	10.8		765
1729	$0.20\text{MgAl}_2\text{O}_4$ - $0.80\text{TiO}_2$	1460	Composite	24.1	48900	5.5	11	195
1730	$\text{Ca}[(\text{Li}_{1/3}\text{Nb}_{2/3})_{0.8}\text{Ti}_{0.2}]\text{O}_{3-d}$ +15 wt% LMZBS	900	Complex Perovskite Orthorhombic	24.1	13500		-21	792
1731	$\text{Li}_2(\text{Mg}_{0.3}\text{Zn}_{0.7})\text{Ti}_3\text{O}_8$ - $0.12\text{TiO}_2$ +2 wt% $\text{BaO-B}_2\text{O}_3$ - $\text{SiO}_2$	900	Spinel	24.1	22000		-4	793
1732	$\text{Ba}(\text{Sn,MgTa})\text{O}_3$		Complex perovskite Hexagonal $\text{P-3m1}$	24.2	120000	6.0		794
1733	$\text{Ca}(\text{Pr}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1550/4h	Complex perovskite Monoclinic	24.2	31500		-39	763
1734	$\text{Ba}[\text{Ti}_{1-x}(\text{Ni}_{1/2}\text{W}_{1/2})_x]\text{O}_3$ ( $x=0.5$ )	1425	Perovskite	24.2	35000		-6	616
1735	$\text{Ba}_8\text{Ta}_6(\text{Ni}_{1-x}\text{Mg}_x)\text{O}_{24}$ ( $x=0.75$ )		Complex perovskite	24.2	93100		26	785
1736	$\text{Ba}(\text{Mg}_{1/2}\text{Ta}_{2/3})\text{O}_3$ :0.5mol% $\text{Ba}(\text{Mg}_{1/2}\text{W}_{1/2})\text{O}_3$		Complex perovskite Trigonal $\text{P-3m1}$	24.2	400000	10		795
1737	$(1-x)\text{MgTiO}_3$ - $x\text{Ca}_{0.8}\text{Sr}_{0.2}\text{TiO}_3$ ( $x=0.1$ )		Composite	24.2	59200		35	572

1738	Bi[Sb <sub>1-x</sub> (Nb <sub>0.992</sub> V <sub>0.008</sub> ) <sub>x</sub> ]O <sub>4</sub> (x=0.1)		Monoclinic I2/c	24.2	33000		-46	715
1739	BaHfO <sub>3</sub>	1750/6h	Cubic perovskite Pm-3m	24.2	14250	8.9	111	675
1740	Li <sub>2</sub> ZnTi <sub>3</sub> O <sub>8</sub> +1 wt% LMZBS	925	Ternary spinel Cubic P4 <sub>3</sub> 32	24.3	58000		-14	738
1741	Li <sub>2</sub> ZnTi <sub>3</sub> O <sub>8</sub> +1 wt% LZB	925	Ternary spinel Cubic P4 <sub>3</sub> 32	24.3	41400		-13	796
1742	Sm <sub>2</sub> Ba <sub>0.75</sub> Sr <sub>0.25</sub> ZnO <sub>5</sub>		Orthorhombic Pnma	24.3	8670	8.17	30	549
1743	0.85(Mg <sub>0.95</sub> Zn <sub>0.05</sub> )TiO <sub>3</sub> - 0.15Ca <sub>0.61</sub> Nd <sub>0.26</sub> TiO <sub>3</sub>	1300	Mixed phases	24.3	112000	8	-10	797
1744	0.9ZnNb <sub>2</sub> O <sub>6</sub> -0.1(2ZnO-V <sub>2</sub> O <sub>5</sub> )	950	Columbite Orthorhombic	24.3	72800		-	678
1745	In <sub>2</sub> O <sub>3</sub> -TiO <sub>2</sub> -Ta <sub>2</sub> O <sub>5</sub>	1525	Composite	24.3	15400		39	583
1746	0.5Zn <sub>3</sub> Nb <sub>2</sub> O <sub>8</sub> -0.5ZnNb <sub>2</sub> O <sub>6</sub>	1200/2h	Composite	24.3	95500		-65	542
1747	0.82BiSbO <sub>4</sub> -0.18Bi <sub>2</sub> Mo <sub>2</sub> O <sub>9</sub>	825	Composite	24.3	24000		-4	798
1748	0.92NaMg <sub>4</sub> V <sub>3</sub> O <sub>12</sub> -0.08CaTiO <sub>3</sub>	730/4h	Composite	24.3	29200	10.5	-4	382
1749	LaTiTaO <sub>6</sub>	1530	Multiphase	24.4	45300		-39	583
1750	Sm <sub>2</sub> Ba <sub>0.15</sub> Sr <sub>0.85</sub> ZnO <sub>5</sub>		Orthorhombic Pnma	24.4	12200	8.19	3	549
1751	(Ca <sub>2</sub> Mg <sub>3</sub> )Ta <sub>2</sub> (Ti <sub>0.75</sub> Zr <sub>0.25</sub> )O <sub>12</sub>	1375		24.4	12400		-32	799
1752	Ca(Nd <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1600/4h	Complex perovskite Monoclinic P2 <sub>1</sub> /n	24.4	22400		-30	750
1753	0.84(Mg <sub>0.95</sub> Co <sub>0.05</sub> )TiO <sub>3</sub> - 0.16(Na <sub>0.5</sub> Nd <sub>0.5</sub> )TiO <sub>3</sub>		Ilmenite Trigonal R-3	24.4	70000		2	800
1754	(Ni <sub>1-x</sub> Zn <sub>x</sub> )Nb <sub>2</sub> O <sub>6</sub> (x=0.2)	1280	Columbite Orthorhombic Pbcn	24.4	24300		-64	778
1755	Li <sub>2</sub> MgTi <sub>3</sub> O <sub>8</sub> +3 wt% LMZBS	925	Ternary spinel cubic P4 <sub>3</sub> 32	24.5	44000		0	738
1756	0.99(Mg <sub>0.7</sub> Zn <sub>0.3</sub> ) <sub>0.95</sub> Co <sub>0.05</sub> TiO <sub>3</sub> -0.1 (La <sub>0.5</sub> Na <sub>0.5</sub> )TiO <sub>3</sub>	1150/4h	Composite	24.5	68000		0	801
1757	Sm <sub>2</sub> Ba <sub>0.1</sub> Sr <sub>0.9</sub> ZnO <sub>5</sub>		Orthorhombic Pnma	24.5	14950	8.2	-36	549
1758	Ba(Mg <sub>0.33</sub> Ta <sub>0.63</sub> Ti <sub>0.017</sub> W <sub>0.017</sub> )O <sub>3</sub>	1600	Complex perovskite Trigonal P-3m1	24.5	100700	5.4	13	438
1759	Ca(Nd <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1550/4h	Complex perovskite Monoclinic	24.5	31800		-37	763
1760	Sm <sub>2</sub> Ba <sub>0.05</sub> Sr <sub>0.95</sub> ZnO <sub>5</sub>		Orthorhombic Pnma	24.6	8690	8.2	82	549
1761	Li <sub>2+x</sub> TiO <sub>3</sub> (x=0.08)		Monoclinic C2/c	24.6	66000		22	802
1762	Ba <sub>4</sub> LiNb <sub>3-x</sub> Sb <sub>x</sub> O <sub>12</sub> (x=1)	1400/4h	Cubic Im3m	24.6	52100		0	803

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
1763	0.85(Mg <sub>0.95</sub> Ni <sub>0.05</sub> )TiO <sub>3</sub> - 0.15Ca <sub>0.6</sub> La <sub>0.8/3</sub> TiO <sub>3</sub>	1325	Composite	24.6	102000		-4	804
1764	Zn <sub>0.95</sub> Mg <sub>0.05</sub> TiO <sub>3</sub> +0.25TiO <sub>2</sub> +1 wt% 3ZnO-B <sub>2</sub> O <sub>3</sub>	880	Composite	24.6	4000		-14	805
1765	Li <sub>2</sub> ZnTi <sub>3</sub> O <sub>8</sub> +0.5 wt% LMZBS	1000	Ternary spinel Cubic P4 <sub>3</sub> 32	24.6	70000		-14	738
1766	(1-x)(Mg <sub>0.95</sub> Ni <sub>0.05</sub> )TiO <sub>3</sub> -xCa <sub>0.6</sub> La <sub>0.8/3</sub> TiO <sub>3</sub> (x=0.15)	1325	Ilmenite Trigonal R-3	24.6	102000		-4	708
1767	(1-x)(Mg <sub>0.095</sub> Zn <sub>0.05</sub> )TiO <sub>3</sub> -x (Na <sub>0.5</sub> Nd <sub>0.5</sub> )TiO <sub>3</sub> (x=0.16)	1300	Composite	24.7	82000	9	0	806
1768	Mg <sub>4</sub> Al <sub>2</sub> Ti <sub>9</sub> O <sub>25</sub>		Psuedobrookite Bbmm	24.7	30,000			807
1769	Ba(Mg <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>3</sub> Annealed 1500/50h WGM		Complex perovskite Trigonal P-3m1	24.7	326250	13.05	8	808
1770	Ba <sub>0.9925</sub> (Mg <sub>0.33</sub> Ta <sub>0.67</sub> )O <sub>3</sub>	1600	Complex perovskite Trigonal P-3m1	24.7	152, 00	5.7	1	809
1771	La(Mg <sub>2/3</sub> Ta <sub>1/3</sub> )O <sub>3</sub>	1600	Perovskite	24.7	65500	10	-65	810
1772	Li <sub>2</sub> (Zn <sub>0.92</sub> Co <sub>0.08</sub> )Ti <sub>3</sub> O <sub>8</sub>	1140	Ternary spinel Cubic P4 <sub>3</sub> 32	24.7	140000		-13	811
1773	Ca(Sm <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1550/4h	Complex perovskite Monoclinic	24.7	33200		-34	763
1774	0.5Mg <sub>4</sub> Nb <sub>2</sub> O <sub>9</sub> -0.5CaTiO <sub>3</sub>		Composite	24.8	82000	9.1	0	812
1775	Mg <sub>0.95</sub> Co <sub>0.05</sub> Ti <sub>2</sub> O <sub>4</sub> -0.78TiO <sub>2</sub>		Composite	24.8	38500		-1	813
1776	Ca[Li <sub>0.33</sub> Nb <sub>0.67</sub> ]O <sub>3</sub> Ti <sub>0.1</sub> O <sub>3-δ</sub> +10 wt% LiF	900	Composite	24.8	19300	4.2	-15	664
1777	SmTaTi <sub>0.25</sub> Zr <sub>0.75</sub> O <sub>6</sub>			24.9	25200		-44	671
1778	Ba(Zn <sub>1/6</sub> Co <sub>1/6</sub> Ta <sub>2/9</sub> Nb <sub>2/9</sub> Sb <sub>2/9</sub> )O <sub>3</sub>	1575/6h	Perovskite	24.9	83000		-13	814
1779	(Ni <sub>1-x</sub> Zn <sub>x</sub> )Nb <sub>2</sub> O <sub>6</sub> (x=0.4)	1220	Columbite Orthorhombic Pbcn	24.9	35400		-66	778
1780	0.85MgTiO <sub>3</sub> -0.15Ca <sub>0.6</sub> La <sub>0.8/3</sub> TiO <sub>3</sub> +0.5 wt% ZnO	1250	Composite	24.9	65200	8	0	815
1781	0.93(Mg <sub>0.95</sub> Ni <sub>0.05</sub> ) <sub>2</sub> TiO <sub>4</sub> -0.07SrTiO <sub>3</sub>	13404h	Composite	24.9	98000	9.8	1	816
1782	Ba[Mg <sub>1-x</sub> Zn <sub>x</sub> ] <sub>1/3</sub> Ta <sub>2/3</sub> ]O <sub>3</sub>		Complex perovskite Trigonal P-3m1	24- 26	200000- 300000	8	-2	817
1783	CaO-ZrO <sub>2</sub> -glass		Glass	25.0	3500			818

1784	Ba(Co <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>3</sub>	1500	Perovskite Trigonal P-3m1	25.0	71400		-16	701
1785	Ca(Eu <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1550/4h	Complex perovskite Monoclinic	25.0	35800		-30	763
1786	La(Co <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub>	1550	Complex perovskite	25.0	67000		-42	748,819
1787	Ca(Ga <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1500/2h	Complex perovskite Orthorhombic Pnma	25.0	80000		-81	820
1788	Ca(Al <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	–	Complex perovskite Orthorhombic	25.0	7500		-87	609
1789	Sr <sub>2</sub> AlNbO <sub>6</sub>	1600	Complex perovskite	25.0	4100		-3	562
1790	Ca(Zn <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>3</sub>		Complex perovskite	25.0	25,000	–	-66	609
1791	ZnNb <sub>2</sub> O <sub>6</sub>	1150/2h	Columbite Orthorhombic Pnca	25.0	83700		-56	729
1792	NiTa <sub>2</sub> O <sub>6</sub>	1600	Tetragonal P4 <sub>2</sub> /mmm	25.0	31000		35	600
1793	Pr <sub>0.1</sub> Gd <sub>0.9</sub> TiNbO <sub>6</sub>	1385	Aeschenite Orthorhombic Pcan	25.0	3450		-15	564
1794	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>1-x</sub> Sn <sub>x</sub> ]O <sub>3-δ</sub> (x=0.15)	1150/3h	Perovskite	25.0	49100		-25	752
1795	(Sr <sub>2/3</sub> La <sub>1/3</sub> )(Li <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>3</sub>		Perovskite	25.0	25000			821
1796	La <sub>6</sub> Mg <sub>4</sub> Nb <sub>2</sub> W <sub>2</sub> O <sub>24</sub>	1400/4h	Perovskite Monoclinic	25.0	16400	5.4	-56	770
1797	(Zn <sub>0.9</sub> Mg <sub>0.1</sub> )TiO <sub>3</sub> +4 wt% Bi <sub>2</sub> O <sub>3</sub>	1000/4h	Composite	25.0	70000		-10	822
1798	Sr(In <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> +0.2 wt% B <sub>2</sub> O <sub>3</sub>	1350/4h	Complex perovskite	25.0	38600		-63	823
1799	Sm(Mg <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub>	1650/2h	Perovskite Orthorhombic Pnm2 <sub>1</sub>	25.0	65500	10	-26	702
1800	BaO-TiO <sub>2</sub> -WO <sub>3</sub> (N-35):5 wt% PbO-SiO <sub>2</sub> -B <sub>2</sub> O <sub>3</sub>	1100	Composite	25.0	6500	6	–	786
1801	Ba <sub>3</sub> MgNb <sub>2-x</sub> Sb <sub>x</sub> O <sub>9</sub> (x=0.25)		Perovskite Trigonal P-3m1	25.0	96290	5.6	6	381
1802	Sr <sub>2/3</sub> La <sub>2/3</sub> [Li <sub>1/3</sub> Ta <sub>2/3</sub> ]O <sub>3</sub>	1350	Monoclinic P2 <sub>1</sub> /c	25.0	25200	10.2	-25	821,824
1803	(1-x)(Mg <sub>0.95</sub> Zn <sub>0.05</sub> )TiO <sub>3</sub> -xCa <sub>0.6</sub> La <sub>0.8/3</sub> TiO <sub>3</sub> (x=0.15)	1320/4h	Composite	25.0	86000		1	465
1804	(Zn <sub>0.65</sub> Mg <sub>0.35</sub> )TiO <sub>3</sub> -0.15TiO <sub>2</sub> +1 wt% CaO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub>	950	Composite	25.0	47000		10	825
1805	BaTe <sub>4</sub> O <sub>9</sub> +40 wt% TiTe <sub>3</sub> O <sub>8</sub>	575	Composite	25.0	19300		-3	826
1806	Ba <sub>4-5x</sub> Mg <sub>8x</sub> Nb <sub>2-y</sub> O <sub>9</sub> (x=0.425, y=0.002)	1320	Trigonal P-3m1	25.0	160000		1	827
1807	(Ni <sub>1-x</sub> Zn <sub>x</sub> )Nb <sub>2</sub> O <sub>6</sub> (x=0.6)	1260	Columbite Orthorhombic Pbcn	25.0	53400		-68	778
1808	La(Co <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub>	1550	Perovskite Orthorhombic Pbnm	25.0	38000		-42	828

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
1809	$\text{Li}_2\text{ZnTi}_3\text{O}_8 + 2 \text{ wt\% MgO-B}_2\text{O}_3\text{-SiO}_2$	900/4h	Ternary spinel Cubic P4 <sub>3</sub> 32	25.0	56200		-10	829
1810	$\text{Li}_2\text{ZnTi}_3\text{O}_8 + 1.5 \text{ wt\% B}_2\text{O}_3$	925/4h	Ternary spinel Cubic P4 <sub>3</sub> 32	25.0	49600		-11	830
1811	$0.4\text{Li}_2\text{Zn}_3\text{Ti}_4\text{O}_{12} - 0.6\text{TiO}_2$	1175	Composite	25.1	62000		-5	831
1812	$0.9\text{LaAlO}_3 - 0.1\text{SrTiO}_3$	1680	Perovskite Composite	25.1	128000	10	-51	832
1813	$\text{Sm}_2\text{Ba}_{0.25}\text{Sr}_{0.75}\text{ZnO}_5$		Tetragonal	25.1	1900	8.17	18	549
1814	$\text{Ba}(\text{Mg}_{0.3183}\text{Ta}_{0.67})\text{O}_3$	1600	Perovskite Hexagonal P-3m1	25.1	120500	5.6	3	809
1815	$\text{Ba}_4\text{LiTa}_2\text{SbO}_{12}$	1480	Hexagonal Perovskite P6 <sub>3</sub> mc	25.1	77700		-4	833
1816	$\text{Li}_2(\text{Mg}_{0.3}\text{Zn}_{0.7})\text{Ti}_3\text{O}_8 - 0.12\text{TiO}_2 + 3 \text{ wt\% ZBS}$	900/3h	Ternary spinel Cubic P4 <sub>3</sub> 32	25.1	19600		2	834
1817	$\text{Ca}[(\text{Li}_{1/3}\text{Nb}_{2/3})_{1-x}\text{Sn}_x]\text{O}_3$ (x=0.1)	1150/3h	Perovskite	25.2	48200		-14	752
1818	$0.17\text{Ba}_5\text{Nb}_4\text{O}_{15} - 0.83\text{BaNb}_2\text{O}_6$	1300	Composite	25.2	59300		0	835
1819	90 wt% $\text{CoNb}_2\text{O}_6 + 10 \text{ wt\% CaTiO}_3$	1150	Composite	25.2	21700		2	545
1820	$0.5\text{ZnAl}_2\text{O}_4 - 0.5\text{TiO}_2$		Composite	25.2	277000		177	406
1821	$\text{Bi}(\text{In}_{1/3}\text{Mo}_{2/3})\text{O}_4$	840	Monoclinic C2/c	25.2	40000		-65	836
1822	$1-x\text{CeO}_2 - x\text{Yb}_2\text{O}_3$ (x=0.25)	1650	Cubic fluorite Fm3m	25.2	47800		-60	413
1823	$\text{Li}_2\text{MgTi}_3\text{O}_8 + 1 \text{ wt\% LMZBS}$	950	Ternary spinel Cubic P4 <sub>3</sub> 32	25.2	55000		1	738
1824	$\text{Li}_2\text{Cu}_{0.1}\text{Zn}_{0.9}\text{Ti}_3\text{O}_8$	950	Ternary spinel Cubic P4 <sub>3</sub> 32	25.2	32100		2	837
1825	$\text{Sm}_2\text{Ba}_{0.5}\text{Sr}_{0.5}\text{ZnO}_5$		Tetragonal	25.3	10075	8.1	30	549
1826	$\text{Li}_2\text{ZnTi}_3\text{O}_8 + 0.25 \text{ wt\% ZnO-B}_2\text{O}_3$	950	Ternary spinel Cubic P4 <sub>3</sub> 32	25.3	61600		-13	838
1827	$\text{TeO}_2 + 7.5 \text{ wt\% CaTiO}_3$		Composite	25.3	10200		-16	444
1828	$0.9\text{MgNb}_2\text{O}_6 - 0.1\text{TiO}_2$	1300	Composite	25.4	19000		-23	545
1829	$1-x\text{CeO}_2 - x\text{Eu}_2\text{O}_3$ (x=0.1)	1650	Cubic fluorite Fm3m	25.4	70300		-64	413
1830	$\text{Ba}[\text{Ti}_{1-x}(\text{Zn}_{1/2}\text{W}_{1/2})_x]\text{O}_3$ (x=0.5)	1420	Cubic perovskite Pm3-m	25.4	11800		9	695
1831	$\text{Li}_2\text{MgTi}_3\text{O}_8 + 0.5 \text{ wt\% LMZBS}$	975	Ternary spinel Cubic P4 <sub>3</sub> 32	25.4	51000		2	738
1832	$\text{PbMoO}_4$	850	Scheelite Tetragonal I4 <sub>1</sub> /a	25.4	35200		-21	49
1833	$\text{La}(\text{Mg}_{0.5}\text{Ti}_{0.5})\text{O}_3 + 30 \text{ wt\% La}_2\text{O}_3\text{-B}_2\text{O}_3\text{-TiO}_2 \text{ glass}$	1200/3h	Composite	25.4	13200		-55	839
1834	$\text{Ba}_5\text{Li}_2\text{W}_3\text{O}_{13} [\text{Ba}(\text{Li}_{2/5}\text{W}_{3/5})\text{O}_3]$	1120	Hexagonal Perovskite	25.4	39000		10	757

1835	0.6Li <sub>2</sub> ZnTi <sub>3</sub> O <sub>8</sub> -0.4Li <sub>2</sub> TiO <sub>3</sub> +1 wt% ZnO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub>	900	Mixture	25.4	86400		-1	840
1836	Nd <sub>2</sub> Ba <sub>0.5</sub> Sr <sub>0.5</sub> ZnO <sub>5</sub>		Tetragonal I4/mcm	25.5	6120		26	730
1837	Sm(Co <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub>	1360/4h	Perovskite Orthorhombic Pnm2 <sub>1</sub>	25.5	76000	10	-16	841
1838	Ba[Mg <sub>1/3</sub> (Nb <sub>1/4</sub> Ta <sub>3/4</sub> ) <sub>2/3</sub> ]O <sub>3</sub>		Complex perovskite Triagonal P-3m1	25.5	140600		5	842
1839	Ca <sub>2</sub> Mg <sub>3</sub> (Ta <sub>1.75</sub> Sb <sub>0.25</sub> )TiO <sub>12</sub>	1375	Mixture phases	25.5	13500		-24	843
1840	0.85MgTiO <sub>3</sub> -0.15Ca <sub>0.6</sub> La <sub>0.8/3</sub> TiO <sub>3</sub>	1275/4h	Composite	25.5	82500		0	844
1841	Ba(In <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub> +0.5 wt% Nb <sub>2</sub> O <sub>5</sub>	1575	Complex perovskite cubic Fm3m	25.5	40050		26	845
1842	BaMg <sub>1/3</sub> Nb <sub>2/3</sub> O <sub>3</sub> -Mg <sub>4</sub> Nb <sub>2</sub> O <sub>9</sub>	1320	Composite	25.5	160000		0	846
1843	Ca(Gd <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1550/4h	Complex perovskite Monoclinic	25.5	11000		-26	763
1844	(Ni <sub>1-x</sub> Zn <sub>x</sub> )Nb <sub>2</sub> O <sub>6</sub> (x=0.8)	1220	Columbite Orthorhombic Pbcn	25.6	90400		-71	778
1845	Ba <sub>10</sub> Ta <sub>7.04</sub> Ti <sub>0.045</sub> Sn <sub>0.75</sub> O <sub>30</sub>		Hexagonal P6 <sub>3</sub> mmc	25.6	59100		30	464
1846	(Zr <sub>0.8</sub> Sn <sub>0.2</sub> )TiO <sub>4</sub> +10 wt% BaO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -Li <sub>2</sub> O-CuO	1000/4h	Composite	25.6	13000		-8	515
1847	Li <sub>2</sub> ZnTi <sub>3</sub> O <sub>8</sub>	1075	Ternary spinel Cubic P4 <sub>3</sub> 32	25.6	72000		-11	847
1848	Li <sub>2</sub> ZnTi <sub>3</sub> O <sub>8</sub> +0.75 wt% ZnO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub>	925	Ternary spinel Cubic P4 <sub>3</sub> 32	25.6	51600		-11	848
1849	Li <sub>2</sub> ZnTi <sub>3</sub> O <sub>8</sub> +1.5 wt% Bi <sub>2</sub> O <sub>3</sub> +0.25 wt% CuO+1.5 wt% V <sub>2</sub> O <sub>5</sub>	875	Spinel cubic P4 <sub>3</sub> 32	25.6	53400		-5	849
1850	CaHfO <sub>3</sub>	1750	Orthorhombic	25.6	15900	9.7	-33	850
1851	Nd <sub>2</sub> SrZnO <sub>5</sub>			25.7	25830	9.7	-80	58,730
1852	Ba <sub>5</sub> Nb <sub>3</sub> TaO <sub>15</sub>	1500	Trigonal P-3m1 perovskite	25.7	21600	4.93	16	851
1853	LiMgTi <sub>3</sub> O <sub>8</sub> +3 wt% MgO-3 wt% LiF	825	Spinel cubic	25.7	57100		-4	852
1854	0.4(Al <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>2</sub> -0.6(Mg <sub>1/2</sub> Ta <sub>2/3</sub> )O <sub>2</sub>	1450	Tetragonal	25.8	111230		-5	214
1855	0.8Mg <sub>0.95</sub> Co <sub>0.05</sub> TiO <sub>3</sub> -0.2Ca <sub>0.6</sub> La <sub>0.8/3</sub> TiO <sub>3</sub>	1300	Composite	25.8	80000	0	-11	853
1856	La <sub>6</sub> Mg <sub>4</sub> Ta <sub>2</sub> W <sub>2</sub> O <sub>24</sub>	1400/4h		25.8	16400		-56	770
1857	Ca(Sm <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1600/4h	Complex perovskite Monoclinic P2 <sub>1</sub> /n	25.8	25000		-25	750
1858	Ca(Yb <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1600/4h	Complex perovskite Monoclinic P2 <sub>1</sub> /n	25.8	59200		-21	750

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
1859	$\text{Li}_2\text{ZnTi}_3\text{O}_8$	1100	Spinel cubic P4 <sub>3</sub> 32	25.8	78200		-11	854
1860	$\text{Li}_2(\text{Mg}_{0.94}\text{Mn}_{0.06})\text{Ti}_3\text{O}_8$	1075	Ternary spinel cubic P4 <sub>3</sub> 32	25.8	39400		-13	855
1861	$0.4(\text{Mg}_{0.95}\text{Co}_{0.05})_4\text{Ta}_2\text{O}_9$ -0.6CaTiO <sub>3</sub>	1375/4h	Composite	25.8	200000		-5	437
1862	$\text{Li}_3\text{ZnTi}_3\text{O}_8$ +1 wt% H <sub>3</sub> BO <sub>3</sub>	880/4h	Ternary spinel Cubic P4 <sub>3</sub> 32	25.9	50200		-7	856
1863	$\text{Li}_2\text{ZnTi}_3\text{O}_8$ +1.5 wt% B <sub>2</sub> O <sub>3</sub> +3 wt% TiO <sub>2</sub>	900	Ternary spinel Cubic P4 <sub>3</sub> 32	25.9	46500		0	857
1864	$\text{Li}_2\text{Mg}_{0.4}\text{Zn}_{0.6}\text{Ti}_3\text{O}_8$	1075/4h	Ternary spinel Cubic P4 <sub>3</sub> 32	25.9	65000		-8	858
1865	$\text{Sr}(\text{Yb}_{0.5}\text{Ta}_{0.5})\text{O}_3$ +0.5 wt% Nb <sub>2</sub> O <sub>5</sub>	1600/4h	Complex perovskite Orthorhombic Pnma	25.9	32300		-79	859
1866	$\text{Ca}(\text{Ni}_{1/3}\text{Nb}_{2/3})\text{O}_3$		Complex perovskite Orthorhombic	26.0	11000	-	-78	609
1867	85 wt% BaTi <sub>4</sub> O <sub>9</sub> +15 wt% Li <sub>2</sub> O-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -CaO-Al <sub>2</sub> O <sub>3</sub>	875	Composite	26.0	10200		0	592
1868	0.85(Mg <sub>0.95</sub> Zn <sub>0.05</sub> )TiO <sub>3</sub> - 0.15Ca <sub>0.6</sub> La <sub>0.8/3</sub> TiO <sub>3</sub>	1320/4h	Composite	26.0	86000		0.5	465
1869	0.5LaCa <sub>0.5</sub> Zr <sub>0.5</sub> O <sub>3</sub> -0.5CaTiO <sub>3</sub>	1575	Composite	26.0	13500	4.5	-67	522
1870	$\text{Nd}(\text{Mg}_{1/2}\text{Ti}_{1/2})\text{O}_3$	1650/2h	Perovskite Monoclinic P21/n	26.0	60000		-72	702,860
1871	$\text{Ca}(\text{Sm}_{1/2}\text{Ta}_{1/2})\text{O}_3$	1600/4h	Complex perovskite	26.0	25000		-25	750
1872	$\text{Ca}(\text{Er}_{1/2}\text{Ta}_{1/2})\text{O}_3$	1600/4h	Complex perovskite	26.0	29600		-12	750
1873	$\text{Ca}(\text{Yb}_{1/2}\text{Ta}_{1/2})\text{O}_3$	1600/4h	Complex perovskite	26.0	59200		-21	750
1874	$\text{Sr}(\text{Yb}_{1/2}\text{Ta}_{1/2})\text{O}_3$	1600/4h	Complex perovskite	26.0	32300		-79	861
1875	$\text{Sr}(\text{In}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1600/4h	Perovskite	26.0	32700		-62	823
1876	BaO-TiO <sub>2</sub> -WO <sub>3</sub> (N-35):5 wt% BaO-SiO <sub>2</sub> -B <sub>2</sub> O <sub>3</sub>	1100	Composite	26.0	8400	6.1	-	862
1877	$\text{Sr}_3\text{Ti}_2\text{O}_7$	1300/5h	Tetragonal I4/mmm	26.0	2400	4		53
1878	LaYbO <sub>3</sub>	1600/4h	Orthorhombic Pnma	26.0	20600	7	-22	863
1879	0.75Ca <sub>2</sub> AlNbO <sub>6</sub> -0.25Ca <sub>3</sub> Nb <sub>2</sub> O <sub>8</sub>		Mixture phases	26.0	13200	6.97	-14	864
1880	2CaO-3NiO-Ta <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1410	Composite	26.0	11000	4.9	-41	230
1881	Ca <sub>5</sub> Nb <sub>2</sub> ZrO <sub>12</sub>	1690	Perovskite	26.0	22800	4.8	-25	662
1882	3CaO-2ZnO-Nb <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1325	Composite	26.0	22000	5.3	-25	230

1883	2CaO-3MgO-Ta <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1450	Composite	26.0	30000	5.1	-28	230
1884	0.2CaTiO <sub>3</sub> -0.8Sm(Mg <sub>0.5</sub> Ti <sub>0.5</sub> )O <sub>3</sub>	1550	Composite	26.0	13500	6	-33	865
1885	MWF-38+10 wt% Li <sub>2</sub> O-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -CaO-Al <sub>2</sub> O <sub>3</sub> (52.45:31.06:11.99:2:2.5)	875	Composite	26.0	10200		-4	510
1886	Ca(Ta <sub>2-x</sub> Nb <sub>x</sub> )O <sub>6</sub> (x=1.2)	1450	Orthorhombic Pbcn	26.0	25300		54	460
1887	1.3Bi <sub>2</sub> O <sub>3</sub> -MoO <sub>3</sub>	820	P2/a	26.0	4000		-139	494
1888	Ba <sub>3</sub> Co <sub>1+y</sub> Nb <sub>2</sub> O <sub>9</sub> +y (y=0.07)	1470	Perovskite Trigonal P-3m1	26.0	90000	10	-5	866
1889	Sr(In <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> +0.5 wt% CeO <sub>2</sub>	1600/4h	Complex perovskite Orthorhombic	26.0	32700		-62	823
1890	Ba(Zn <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>3</sub> +5 mol% B <sub>2</sub> O <sub>3</sub> +10 mol% CuO	870/2h	Complex perovskite Trigonal P-3m1	26.0	11000		0	867
1891	MgZrNb <sub>2</sub> O <sub>8</sub>	1340/4h	Wolframite Monoclinic P2/c	26.0	120800	6.85	-50	868
1892	MgZrNb <sub>2</sub> O <sub>8</sub> +2 wt% BaCu(B <sub>2</sub> O <sub>5</sub> )	1100/4h	Monoclinic P2/c	26.0	65100	8.7	-47	869
1893	Ba <sub>10</sub> Ta <sub>7.04</sub> Sn <sub>0.75</sub> O <sub>30</sub>		Hexagonal P6 <sub>3</sub> mmc	26.0	59100		-	870
1894	Li <sub>2</sub> Mg(Ti <sub>1-x</sub> Sn <sub>x</sub> g <sub>0.06</sub> ) <sub>3</sub> O <sub>8</sub> (x=0.15)	1100/4h	Spinel Cubic P4 <sub>3</sub> 32	26.0	74700		-5	871
1895	0.5CeO <sub>2</sub> -0.25ZnO-0.25TiO <sub>2</sub>	1250	Mixture phases	26.1	24100	5.1	-43	488
1896	Ca[(Li <sub>1/3</sub> Ta <sub>2/3</sub> ) <sub>0.95</sub> Ti <sub>0.05</sub> ]O <sub>3-d</sub> +3 wt% B <sub>2</sub> O <sub>3</sub>	1050/4h	Perovskite	26.1	22000	10.3	-97	765
1897	0.35(Al <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>2</sub> -0.65(Mg <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>2</sub>	1450	Composite	26.1	112500		0	214
1898	ZnNb <sub>2</sub> O <sub>6</sub>	1200	Columbite Orthorhombic Pbcn	26.1	103730		-73	778
1899	Li <sub>2</sub> (Zn <sub>0.94</sub> Mg <sub>0.06</sub> )Ti <sub>3</sub> O <sub>8</sub>	1140	Ternary spinel Cubic P4 <sub>3</sub> 32	26.1	150000		-14	811
1900	0.9Li <sub>2</sub> ZnTi <sub>3</sub> O <sub>8</sub> -0.1TiO <sub>2</sub>	1100	Ternary spinel Cubic P4 <sub>3</sub> 32	26.1	44500		-1	872
1901	0.81Mg <sub>0.95</sub> Ni <sub>0.05</sub> TiO <sub>3</sub> - 0.19Nd <sub>0.5</sub> Na <sub>0.5</sub> TiO <sub>3</sub>	1300	Composite	26.1	69100		-6	873
1902	Li <sub>2</sub> ZnTi <sub>3</sub> O <sub>8</sub> +1 wt% LZB+3.5 wt% TiO <sub>2</sub>	900/4h	Ternary spinel Cubic P4 <sub>3</sub> 32	26.1	45200		-4	874
1903	0.8(Mg <sub>0.95</sub> Zn <sub>0.05</sub> )TiO <sub>3</sub> - 0.2Ca <sub>0.61</sub> Nd <sub>0.26</sub> TiO <sub>3</sub> +1 wt% V <sub>2</sub> O <sub>5</sub>	1275	Composite	26.1	46000	8	2	875
1904	Bi(Ga <sub>1/3</sub> Mo <sub>2/3</sub> )O <sub>4</sub>	830	Monoclinic sheelite C2/c	26.1	49800		-86	876
1905	Ca <sub>2</sub> Mg <sub>3</sub> Nb <sub>4</sub> TiO <sub>17</sub>	1525		26.2	13750		-24	877

(continued)



No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
1906	MgTa <sub>1.3</sub> Nb <sub>0.7</sub> O <sub>6</sub>	1450	Columbite tetragonal P4 <sub>2</sub> /mmm	26.2	43100		-4	878
1907	Nd(Mg <sub>0.5</sub> Ti <sub>0.5</sub> )O <sub>3</sub> +10 mol% B <sub>2</sub> O <sub>3</sub>	1325	Monoclinic P2 <sub>1</sub> /n	26.2	61300	9.63	-46	879
1908	1-xCeO <sub>2</sub> -xDy <sub>2</sub> O <sub>3</sub> (x=0.20)	1650	Cubic fluorite Fm3m	26.2	70150		-57	413
1909	0.87(Mg <sub>0.7</sub> Zn <sub>0.3</sub> )TiO <sub>3</sub> - 0.13(Ca <sub>0.61</sub> La <sub>0.26</sub> )TiO <sub>3</sub>	1270	Composite	26.2	120000		-3	880
1910	(Zn <sub>0.65</sub> Mg <sub>0.35</sub> )TiO <sub>3</sub> +1 wt% CuV <sub>2</sub> O <sub>6</sub> +9 wt% TiO <sub>2</sub>	930	Composite	26.2	31930		-0	881
1911	Li <sub>2</sub> ZnTi <sub>3</sub> O <sub>8</sub>	1050	Ternary spinel Cubic P4 <sub>3</sub> 32	26.2	62000		-15	882
1912	TeO <sub>2</sub> +17.5 wt% SrTiO <sub>3</sub>	610	Composite	26.2	12000		16	444
1913	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>0.8</sub> Ti <sub>0.2</sub> ]O <sub>3-d</sub> +12 wt% LMZBS glass	900/4h	Composite	26.2	13000	4.8	-20	792
1914	Ba(Mg <sub>0.30</sub> Ta <sub>0.60</sub> Ti <sub>0.10</sub> )O <sub>3</sub>	1600	Complex perovskite Trigonal P-3m1	26.3	100000	5.2	14	883
1915	0.5CeO <sub>2</sub> -0.25MnO-0.25TiO <sub>2</sub>	1200	Mixture phases	26.3	17100	5	-30	488
1916	(1-x)(Mg <sub>0.95</sub> Zn <sub>0.05</sub> )TiO <sub>3</sub> -x(Ca <sub>0.6</sub> La <sub>0.8/3</sub> ) TiO <sub>3</sub> (x=0.21)		Composite	26.3	60700	6.44	0	884
1917	(Ca <sub>2</sub> Mg <sub>3.75</sub> Pb <sub>0.25</sub> )Ta <sub>2</sub> (Ti <sub>0.75</sub> Zr <sub>0.25</sub> )O <sub>12</sub>	1375		26.3	14000		-22	799
1918	(Ag <sub>0.5</sub> Bi <sub>0.5</sub> )(Mo <sub>0.5</sub> W <sub>0.5</sub> )O <sub>4</sub>	580	Tetragonal Scheelite I41/A	26.3	10000		20	885
1919	Bi <sub>2</sub> Te <sub>2</sub> W <sub>3</sub> O <sub>16</sub>	700/6h	Monoclinic C2/c	26.3	2250	7.9		886
1920	ZnZr(Nb <sub>1-x</sub> Sb <sub>x</sub> ) <sub>2</sub> O <sub>8</sub> (x=0.08)	1250/4h	Monoclinic wolframite	26.3	89400		-57	887
1921	0.75(Al <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>2</sub> -0.25(Ti <sub>1-x</sub> Sn <sub>x</sub> )O <sub>2</sub> (x=0.05-0.3)		Tetragonal	26.3- 30.0	63400- 70700		<10	790
1922	Nd <sub>2</sub> Ba <sub>0.5</sub> Ca <sub>0.5</sub> ZnO <sub>5</sub>			26.4	6185		24	730
1923	Ca(Er <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1600/4h	Complex perovskite Monoclinic P2 <sub>1</sub> /n	26.4	29600		-12	750
1924	Ba[Ti <sub>1-x</sub> (Zn <sub>1/2</sub> W <sub>1/2</sub> ) <sub>x</sub> ]O <sub>3</sub> (x=0.7)	1420	Perovskite	26.4	22900		-2	695
1925	LiBiW <sub>2</sub> O <sub>8</sub>	650	Monoclinic	26.5	16400		70	888
1926	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>0.8</sub> Ti <sub>0.2</sub> ]O <sub>3-d</sub> +12 wt% LBS	920	Perovskite Orthorhombic	26.5	7000		-18	792
1927	0.2(Al <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>2</sub> -0.8(Mg <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>2</sub>	1450		26.5	103190		25	214

1928	Ba <sub>3</sub> NiNb <sub>2-x</sub> Sb <sub>x</sub> O <sub>9</sub> (x=0.1)		Perovskite Cubic Pm3m	26.5	31110	5	-13	381
1929	(1-x)La(Mg <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> -xLa <sub>2/3</sub> TiO <sub>3</sub> (x=0.1)		Perovskite Monoclinic P2 <sub>1</sub> /n	26.5	30580	8.3		889
1930	Ba[Ti <sub>1-x</sub> (Ni <sub>1/2</sub> W <sub>1/2</sub> ) <sub>x</sub> ]O <sub>3</sub> (x=0.45)	1425	Perovskite	26.5	30800		-3	616
1931	BaO-Sm <sub>2</sub> O <sub>3</sub> -4TiO <sub>2</sub> +10 wt% B <sub>2</sub> O <sub>3</sub>	1100/2h	Composite	26.5	11800		-10	890
1932	Ca(Tb <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1550/4h	Complex perovskite Monoclinic	26.5	34600		-13	763
1933	Ba <sub>3</sub> Ti <sub>5</sub> Nb <sub>6</sub> O <sub>28</sub> +5 wt% CuO	900/2h	Monoclinic P2 <sub>1</sub> /c	26.6	14100		21	461
1934	Ba <sub>8</sub> Ta <sub>6</sub> (Ni <sub>1-x</sub> Mg <sub>x</sub> )O <sub>24</sub> (x=0.5)		Hexagonal P6 <sub>3</sub> cm	26.6	86800		31	785
1935	Ba <sub>8</sub> Ta <sub>6</sub> MgO <sub>24</sub>		Hexagonal P6 <sub>3</sub> cm	26.6	80900		18	785
1936	Li <sub>2</sub> CoTi <sub>3</sub> O <sub>8</sub> +2 wt% B <sub>2</sub> O <sub>3</sub>	900	Cubic spinel P4 <sub>3</sub> 32	26.6	21300		2	891
1937	Li <sub>2</sub> (Mg <sub>0.94</sub> Co <sub>0.06</sub> )Ti <sub>3</sub> O <sub>8</sub>	1075	Cubic spinel P4 <sub>3</sub> 32	26.6	43600		4	855
1938	0.8Mg <sub>0.95</sub> Zn <sub>0.05</sub> TiO <sub>3</sub> -0.2Ca <sub>0.61</sub> Nd <sub>0.26</sub> TiO <sub>3</sub> +1 wt% B <sub>2</sub> O <sub>3</sub>	1175	Composite	26.6	54900	9	9	892
1939	Ba <sub>2</sub> Ti <sub>9</sub> O <sub>20</sub> +20 wt% BaO-B <sub>2</sub> O <sub>3</sub> -ZnO glass	900	Composite	26.6	11950		-7	893
1940	TeO <sub>2</sub> +15 wt% SrTiO <sub>3</sub>	610	Composite	26.6	12400		-4	444
1941	Ca <sub>x</sub> Zn <sub>1-x</sub> Zr <sub>0.8</sub> Sn <sub>0.2</sub> Nb <sub>2</sub> O <sub>8</sub> (x=0.15)	1275	Mixture	26.6	61350		-21	894
1942	Sr <sub>6</sub> Ta <sub>4</sub> ZrO <sub>18</sub> +3 wt% Bi <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub>	1625/2h	A <sub>6</sub> B <sub>5</sub> O <sub>18</sub> type perovskite	26.7	9100		-39	895
1943	0.8LaAlO <sub>3</sub> -0.2SrTiO <sub>3</sub>	1680	Composite	26.7	139000	10	-50	832
1944	0.9TeO <sub>2</sub> -SnTe <sub>3</sub> O <sub>8</sub>	650	Mixture phase	26.7	10000		32	62
1945	TeO <sub>2</sub> +20 wt% SrTiO <sub>3</sub>	610	Composite	26.7	11400		31	444
1946	Li <sub>2</sub> Mg <sub>0.95</sub> Co <sub>0.05</sub> Ti <sub>3</sub> O <sub>8</sub>	1170	Cubic Spinel	26.7	82000		-3	896
1947	PbMoO <sub>4</sub>	650/2h	Tetragonal I4 <sub>1</sub> /a	26.7	42800	6.2	6	897
1948	Sm(Mg <sub>0.5</sub> Ti <sub>0.5</sub> )O <sub>3</sub> +10 mol% B <sub>2</sub> O <sub>3</sub>		Perovskite	26.8	20000		-18	898
1949	Ca(Eu <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1600/4h	Complex perovskite Monoclinic P2 <sub>1</sub> /n	26.8	23600		-22	750
1950	La(Mg <sub>2/3</sub> Nb <sub>1/3</sub> )O <sub>3</sub>	1500/4h	Perovskite Rhombohedral	26.8	52000		-86	899
1951	(Zr <sub>0.8</sub> Sn <sub>0.2</sub> )TiO <sub>4</sub> +10 wt% BaO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -Li <sub>2</sub> O-CuO	1000/8h	Composite	26.8	21900		-1	515
1952	Li <sub>2</sub> ZnTi <sub>3</sub> O <sub>8</sub> +4 wt% TiO <sub>2</sub> +1 wt% CBS glass	900/4h	Cubic+rutile	26.9	23600		-1	900

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
1953	$\text{Ca}(\text{Cu}_{1/3}\text{Nb}_{2/3})\text{O}_3$		Complex perovskite Orthorhombic	27.0	3300	–	–	609
1954	$\text{Li}_2\text{Mg}_{0.2}\text{Zn}_{0.8}\text{Ti}_3\text{O}_8$	1075/4h	Ternary spinel Cubic $\text{P4}_332$	27.0	66500		–50	858
1955	$\text{Sr}(\text{Ga}_{1/2}\text{Ta}_{1/2})\text{O}_3$	1500/3h	Perovskite	27.0	91000		–	901
1956	$\text{La}(\text{Mg}_{1/2}\text{Ti}_{1/2})\text{O}_3$ sol-gel	–	Monoclinic Perovskite $\text{P2}_1/\text{n}$	27.0	74500		–9	902
1957	$\text{Ca}(\text{Y}_{1/2}\text{Ta}_{1/2})\text{O}_3$	1600/4h	Perovskite Monoclinic $\text{P2}_1/\text{n}$	27.0	42300		–1	750
1958	$0.6\text{Ca}(\text{Y}_{1/2}\text{Ta}_{1/2})\text{O}_3$ -0.4 $\text{Ba}(\text{Y}_{1/2}\text{Ta}_{1/2})\text{O}_3$	1600/4h	Perovskite	27.0	42000		–77	750
1959	$\text{Sr}(\text{Er}_{1/2}\text{Ta}_{1/2})\text{O}_3$	1600/4h	Perovskite	27.0	22100		–88	861
1960	$\text{Ca}_2\text{AlNbO}_6$		Perovskite Monoclinic $\text{P2}_1/\text{n}$	27.0	14000	7.02	0	864
1961	$\text{Ba}(\text{Mg}_{1/3}\text{Ta}_{2/3})\text{O}_3$ - $\text{Ba}(\text{Zn}_{1/3}\text{Ta}_{2/3})\text{O}_3$		Complex perovskite Trigonal $\text{P-3m1}$	27.0	150000	10		903
1962	$\text{BaO-TiO}_2\text{-WO}_3$ (N-35)+5 wt% $\text{ZnO-B}_2\text{O}_3\text{-SiO}_2$	1000	Composite	27.0	8400	7.0		786,862
1963	$\text{Ca}(\text{Yb}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1500	Perovskite	27.0	7200	8.4	–30	590
1964	$\text{BaO-TiO}_2\text{-WO}_3$ (N-35):5 wt% $\text{PbO-Al}_2\text{O}_3\text{-SiO}_2$	1100	Composite	27.0	8400	6.1	–	786,862
1965	$\text{Ba}_8\text{Ta}_6\text{Ni}_{0.25}\text{Zn}_{0.75}\text{O}_{24}$		Trigonal $\text{P6}_3\text{cm}$	27.0	91730		35	785
1966	$\text{BaTi}_4\text{O}_9$ +20 wt% $\text{B}_2\text{O}_3\text{-ZnO-L}_2\text{O}_3$	900/3h	Composite	27.0	20000		7	904
1967	$\text{Nd}(\text{Co}_{1/2}\text{Ti}_{1/2})\text{O}_3$	1440/4h	Monoclinic $\text{P2}_1/\text{n}$	27.0	140000	9	–46	905
1968	$\text{Ba}_6\text{Ta}_4\text{TiO}_{18}$	1625/2h		27.0	27500		45	895
1969	$\text{CaZrO}_3$		Perovskite Orthorhombic $\text{Pcmn}$	27.0	20800			906
1970	$\text{Ba}(\text{Mn}_{1/3}\text{Ta}_{2/3})\text{O}_3$	1600/air	Perovskite Trigonal $\text{P-3m1}$	27.0	15500		45	907
1971	$\text{Ba}(\text{Mn}_{1/3}\text{Ta}_{2/3})\text{O}_3$	1600/N <sub>2</sub>	Perovskite Trigonal $\text{P-3m1}$	27.0	104000		45	907
1972	$0.3\text{CaTiO}_3$ -0.7 $\text{Sm}(\text{Mg}_{0.5}\text{Ti}_{0.5})\text{O}_3$	1550	Composite	27.0	11970	5.8	–29	865
1973	$\text{ZnO-TiO}_2$ -2 wt% $\text{ZnO-B}_2\text{O}_3\text{-SiO}_2$	930/3h	Composite	27.0	20000		2	908
1974	$\text{BaO-2CeO}_2$ -4 $\text{TiO}_2$	1250	Composite	27.0	18560		9	909
1975	$\text{Ba}_5\text{Nb}_2\text{Ta}_2\text{O}_{15}$	1475	Trigonal $\text{P-3m1}$ perovskite	27.0	10600	4.7	22	851
1976	$\text{Li}_2\text{ZnTi}_3\text{O}_8$ +2 wt% $\text{Li}_2\text{WO}_4$	860/4h	Composite	27.0	51100		–4	910
1977	$\text{Nd}_5\text{Ti}_4\text{CrO}_{17}$	1600/4h	Monoclinic	27.0	6400		–94	911

1978	CaO-4NiO-Nb <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1185	Composite	27.0	4000	4.6	-58	230
1979	Ba <sub>3</sub> NiNb <sub>2-x</sub> Sb <sub>x</sub> O <sub>9</sub> (x=0.25)		Perovskite Cubic Pm3m	27.0	27370	5	-21	381
1980	LaGaO <sub>3</sub>		Perovskite Orthorhombic Pnma	27.0	97000	5	-80	912
1981	Ba(Zn <sub>1/2</sub> Ta <sub>2/3</sub> )O <sub>3</sub> +1 mol% CeO <sub>2</sub>	1525/6h, 1350/5h	Complex perovskite Trigonal P-3m1	27.0	123000		14	913
1982	Ba[(Mg <sub>0.4</sub> Zn <sub>0.6</sub> )Ta <sub>2/3</sub> ]O <sub>3</sub>	1600/4h	Perovskite Trigonal P-3m1	27.0	109900		4	883
1983	0.7Ba(Mg <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>3</sub> - 0.3Ba(Co <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub>	1530/5h	Complex perovskite Trigonal P-3m1	27.0	172700		-1	914
1984	Li <sub>2</sub> Mg <sub>0.9</sub> Zn <sub>0.1</sub> Ti <sub>3</sub> O <sub>8</sub>	1075/4h	Ternary spinel Cubic P4 <sub>3</sub> 32	27.0	62000		1	858
1985	Li <sub>2</sub> Zn <sub>0.95</sub> Ca <sub>0.05</sub> Ti <sub>3</sub> O <sub>8</sub>	1075/4h	Ternary spinel Cubic P4 <sub>3</sub> 32	27.0	51100		-2	858
1986	Bi(Sb <sub>0.6</sub> Ta <sub>0.4</sub> )O <sub>4</sub>	1000	Monoclinic I2/c	27.0	35000		-15	915
1987	Ca(Zr <sub>x</sub> Ti <sub>1-x</sub> )O <sub>3</sub> (x=1)	1515/15h	Perovskite Orthorhombic Pcnmn	27.0	16500	5.35	-20	916
1988	Ba <sub>3</sub> LiTa <sub>3-x</sub> Sb <sub>x</sub> Ti <sub>5</sub> O <sub>21</sub> (x=3)	1220	Hexagonal P6 <sub>3</sub> /mcm	27.0	29400		-25	917
1989	Nd(Co <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> +1 wt% P <sub>2</sub> O <sub>5</sub> -ZnO- La <sub>2</sub> O <sub>3</sub> -Al <sub>2</sub> O <sub>3</sub> -Na <sub>2</sub> O-MgO-Yb <sub>2</sub> O <sub>3</sub> glass	1300	Monoclinic P2 <sub>1</sub> /n Perovskite	27.0	64000		-29	918
1990	Ba <sub>1/3</sub> Pr <sub>2/3</sub> Zn <sub>1/3</sub> Ti <sub>2/3</sub> O <sub>3</sub>		Not available	27.0	1000	5.07	-22	919
1991	Ba <sub>1/2</sub> Sr <sub>1/2</sub> (Zn <sub>1/6</sub> Co <sub>1/6</sub> Ta <sub>2/9</sub> Nb <sub>2/9</sub> Sb <sub>2/9</sub> )O <sub>3</sub>	1550/6h	Perovskite	27.0	32100		-23	814
1992	Ba <sub>8</sub> NiTa <sub>6</sub> O <sub>24</sub>		Hexagonal P6 <sub>3</sub> cm	27.0	81800			785
1993	Ba <sub>5</sub> Sr <sub>2</sub> Ta <sub>4</sub> ZrO <sub>21</sub>		A <sub>n</sub> B <sub>n-1</sub> O <sub>3n</sub> Hexagonal Perovskite	27.0	9800			920
1994	Ba(La <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1450	Perovskite Cubic Fm3m	27.1	18000	8.7	51	590
1995	Sr(La <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1500	Perovskite Cubic Fm3m	27.1	2600	8.4	-29	590
1996	(Mg <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>2</sub>	1550	Tetragonal P4 <sub>2</sub> mmm	27.1	95360		51	454
1997	Li <sub>2</sub> (Mg <sub>0.94</sub> Zn <sub>0.06</sub> )Ti <sub>3</sub> O <sub>8</sub>	1075	Cubic spinel P4 <sub>3</sub> 32	27.1	44800		2	855
1998	Sr(Nd <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1500	Perovskite ubic Fm3m	27.1	25000	8.3	-68	590
1999	Sr(Er <sub>0.5</sub> Ta <sub>0.5</sub> )O <sub>3</sub> +0.5 wt% Nb <sub>2</sub> O <sub>5</sub>	1600/4h	Complex perovskite Tetragonal	27.1	22100		-77	859
2000	Mg <sub>0.5</sub> Zn <sub>0.5</sub> ZrNb <sub>2</sub> O <sub>8</sub>	1260	Monoclinic P2/c	27.1	91100		-18	921
2001	Ca(Gd <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1600/4h	Complex perovskite Monoclinic	27.2	26000		-16	750
2002	Nd(Co <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> +0.75 wt% B <sub>2</sub> O <sub>3</sub>	1320/4h	Perovskite Monoclinic P2 <sub>1</sub> /n	27.2	153000	9	0	922
2003	Ba <sub>3</sub> LiSb <sub>3</sub> Ti <sub>5</sub> O <sub>21</sub>	1220	Hexagonal P6 <sub>3</sub> /mcm	27.2	29400		-25	923

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
2004	$\text{Li}_2\text{MgTi}_3\text{O}_8$	1075	Ternary spinel Cubic P4 <sub>3</sub> 32	27.2	42000		3	847
2005	$\text{Bi}_3\text{FeMo}_2\text{O}_{12}$	845/2h	Monoclinic sheelite C2/c	27.2	14500		−80	924
2006	$\text{Ba}_2\text{Ti}_9\text{O}_{20}+1 \text{ wt}\% \text{ ZnO-B}_2\text{O}_3$	940/2h	Monoclinic P-1	27.3	8300	7.2	3	925
2007	$\text{MgTa}_{1.4}\text{Nb}_{0.6}\text{O}_6$	1450	Columbite Tetragonal P4 <sub>2</sub> /mmm	27.3	40800		−3	926
2008	$\text{Ba}_8\text{Ta}_6(\text{Ni}_{1-x}\text{Zn}_x)\text{O}_{24}$ (x=0.5)		Hexagonal P6 <sub>3</sub> cm	27.4	83800		36	785
2009	$\text{Nd}(\text{Co}_{1/2}\text{Ti}_{1/2})\text{O}_3+0.5 \text{ wt}\% \text{ ZnO}$	1350	Perovskite Monoclinic P2 <sub>1</sub> /n	27.4	147000	8	−30	927
2010	$\text{ZnZr}_{0.8}\text{Sn}_{0.2}\text{Nb}_2\text{O}_8$	1275/6h	Monoclinic P2/c	27.4	76800	7	−55	928
2011	$\text{TeO}_2+10 \text{ wt}\% \text{ SrTiO}_3$		Composite	27.5	13100		−46	444
2012	$\text{Ba}_8\text{Ta}_6\text{NiO}_{24}$		Hexagonal P6 <sub>3</sub> cm	27.5	81750		33	785
2013	$\text{Sr}(\text{La}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1500	Perovskite Cubic Fm3m	27.5	2000	8.3	−33	590
2014	$\text{Sr}(\text{Zn}_{1/2}\text{W}_{1/2})\text{O}_3$	1360	Perovskite Cubic Fm3m	27.5	51000	7.0	−45	528
2015	$0.8\text{La}(\text{Mg}_{1/2}\text{Ti}_{1/2})\text{O}_3-0.2\text{La}_{2/3}\text{TiO}_3$	1500/2h	Composite	27.5	16600	7.9		929
2016	$\text{Ba}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3+\text{B}_2\text{O}_3$	900	Perovskite Trigonal P-3m1	27.5	8500		27	930
2017	$(1-x)\text{La}(\text{Mg}_{1/2}\text{Ti}_{1/2})\text{O}_3-x\text{La}_{2/3}\text{TiO}_3$ (x=0.2)		Perovskite Monoclinic P2 <sub>1</sub> /n	27.5	16600	7.89		889
2018	$\text{Sr}(\text{Y}_{0.5}\text{Ta}_{0.5})\text{O}_3+0.5 \text{ wt}\% \text{ Nb}_2\text{O}_5$	1600/4h	Complex perovskite Rhombohedral R3m	27.5	54300		−77	859
2019	90 wt%(Zr,Sn)TiO <sub>4</sub> +10 wt% Li <sub>2</sub> O-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub>	875	Composite	27.5	9000		14	592
2020	$\text{ZnTiO}_3-0.25\text{TiO}_2$	925	Composite	27.5	14000		−20	931
2021	$\text{Ba}_8\text{Ta}_6(\text{Ni}_{1-x}\text{Zn}_x)\text{O}_{24}$ (x=0.75)		Hexagonal P6 <sub>3</sub> mc	27.6	91700		37	785
2022	$\text{Ca}[(\text{Li}_{1/3}\text{Ta}_{2/3})_9\text{Ti}_{0.1}]\text{O}_{3-d}+3 \text{ wt}\% \text{ B}_2\text{O}_3$	1000/4h	Perovskite	27.6	9800	10.2	−	765
2023	$\text{La}(\text{Mg}_{1/2}\text{Ti}_{1/2})\text{O}_3$	1600	Monoclinic perovskite P2 <sub>1</sub> /n	27.6	114300	7.1	−81	932,933
2024	$(\text{Ca}_2\text{Mg}_3)\text{Nb}_2(\text{Ti}_{0.75}\text{Zr}_{0.25})\text{O}_{12}$	1275		27.6	7600		−36	799
2025	$\text{Li}_2\text{Zn}_x\text{Co}_{1-x}\text{Ti}_3\text{O}_8$ (x=0.4)	1050/2h	Cubic spinel P4 <sub>3</sub> 32	27.7	57100		1	934
2026	$\text{Li}_2\text{Zn}_{0.9}\text{Ca}_{0.1}\text{Ti}_3\text{O}_8$	1075/4h	Ternary spinel Cubic P4 <sub>3</sub> 32	27.7	44500		11	858
2027	$\text{Sr}(\text{Sm}_{1/2}\text{Ta}_{1/2})\text{O}_3$	1500	Perovskite	27.7	59000	8.5	−63	590
2028	$\text{Sr}(\text{Ho}_{0.5}\text{Ta}_{0.5})\text{O}_3+0.5 \text{ wt}\% \text{ Nb}_2\text{O}_5$	1600/4h	Complex perovskite Tetragonal	27.7	38800		−75	859
2029	$\text{Ba}[(\text{Mg}_{0.4}\text{Zn}_{0.6})\text{Ta}_{2/3}]\text{O}_3$	1575	Complex perovskite Trigonal P-3m1	27.7	109900	4.6	6.3	883

2030	Ba <sub>6</sub> Ta <sub>4</sub> ZrO <sub>18</sub> +2 wt% Bi <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub>	1625/2h	A <sub>6</sub> B <sub>5</sub> O <sub>18</sub> type perovskite	27.8	41000		5	895
2031	Li <sub>2</sub> ZnTi <sub>3</sub> O <sub>8</sub> +2 wt% Bi <sub>2</sub> O <sub>3</sub>	950	Cubic P4 <sub>3</sub> 32	27.8	36400			935
2032	Ba <sub>5</sub> SrTa <sub>4</sub> ZrO <sub>18</sub> +2 wt% Bi <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub>	1625/2h	A <sub>6</sub> B <sub>5</sub> O <sub>18</sub> type perovskite	27.8	18500		37	895
2033	Sm <sub>0.78</sub> Y <sub>0.22</sub> TiNbO <sub>6</sub>	1400	Orthorhombic Pbnm	27.9	2300		11	564
2034	MgNb <sub>2</sub> O <sub>6</sub>	1450	Columbite Orthorhombic Pcan	27.9	91500			926
2035	MgTa <sub>1.5</sub> Nb <sub>0.5</sub> O <sub>6</sub>	1450	Columbite Tetragonal P4 <sub>2</sub> /mmm	27.9	33100		-1	926
2036	0.8(Mg <sub>0.95</sub> Co <sub>0.05</sub> )TiO <sub>3</sub> - 0.2(Ca <sub>0.6</sub> La <sub>0.8/3</sub> TiO <sub>3</sub> +1 wt% ZnO	1250	Mixed phases	27.9	36000	8	14	936
2037	Ba <sub>8</sub> Ta <sub>6</sub> (Ni <sub>1-x</sub> Mg <sub>x</sub> )O <sub>24</sub> (x=0.25)		Hexagonal P6 <sub>3</sub> cm	27.9	81500		32	785
2038	Sr <sub>1-x</sub> Ca <sub>x</sub> (Ga <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>		Perovskite	26- 28	18000- 90000	8	-50 to-97	937
2039	Zn <sub>0.9</sub> Co <sub>0.1</sub> ZrNb <sub>2</sub> O <sub>8</sub>	1240/4h	Monoclinic P2/c	27.9	68600	6.95	-62	938
2040	BaTi <sub>4</sub> O <sub>9</sub> -10 mol% BaO-ZnO-B <sub>2</sub> O <sub>3</sub> glass	925	Composite	28- 33	20000	6.6		939
2041	Nd(Mg <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub>	1650/2h	Monoclinic perovskite P2 <sub>1</sub> /n	28.0	36900	10	-49	702
2042	Ba <sub>1/3</sub> Nd <sub>2/3</sub> Zn <sub>1/3</sub> Ti <sub>2/3</sub> O <sub>3</sub>			28.0	1500	5.03	-19	919
2043	(Zn <sub>0.9</sub> Mg <sub>0.1</sub> )TiO <sub>3</sub> +1 wt% V <sub>2</sub> O <sub>5</sub>	950/4h	Trigonal R-3	28.0	67200		-8	940
2044	Ba <sub>4</sub> LiNb <sub>3-x</sub> Ta <sub>x</sub> O <sub>12</sub> (x=3)	1450	Hexagonal perovskite P6 <sub>3</sub> mc	28.0	103600		25	941
2045	0.47BaTe <sub>4</sub> O <sub>9</sub> -0.53TiTe <sub>3</sub> O <sub>8</sub>	560	Composite	28.0	12000	10	4	942
2046	Ca(Zr <sub>x</sub> Ti <sub>1-x</sub> )O <sub>3</sub> (x=0.8)	1470/15h	Perovskite Cubic Pm3m	28.0	3500	4.35	170	916
2047	Ba(Tb <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1625	Perovskite	28.0	28200		-38	943
2048	Ca(Mg <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub>		Complex perovskite Orthorhombic	28.0	58000	-	-48	609,944
2049	Sr(Zn <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>3</sub>	1500	Perovskite Cubic Pm3m	28.0	21700		-54	701
2050	Ba(Zn <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>3</sub>	1350/ 120h	Complex perovskite Trigonal P-3m1	28.0	168000		1	903
2051	0.6Ca(Yb <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub> -0.4 Ba(Yb <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1600/4h	Perovskite	28.0	48000		2	750
2052	Ca(Yb <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub> +4 mol% CaTiO <sub>3</sub>	1600/4h	Perovskite	28.0	41000		-2	750

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
2053	Ba[Zr <sub>0.0645</sub> Ni <sub>0.1625</sub> Zn <sub>0.816</sub> Ta <sub>1.957</sub> ]O <sub>3</sub>	1520/48h	Perovskite Trigonal P-3m1	28.0	136770		-3	945
2054	Ba(Zn <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>3</sub> +1 mol% Cr <sub>2</sub> O <sub>3</sub>	1525/6h	Complex perovskite Hexagonal P-3m1	28.0	125500		-2	913
2055	Ca(Ho <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1600/4h	Perovskite Monoclinic P2 <sub>1</sub> /n	28.0	23700		-8	750
2056	Sr(Dy <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1600/4h	Perovskite	28.0	34200		-73	861
2057	Sr(Ho <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1600/4h	Perovskite	28.0	38800		-75	861
2058	Sr(Y <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1600/4h	Perovskite Monoclinic P2 <sub>1</sub> /n	28.0	54300		-77	861
2059	Ca(Ca <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub>		Perovskite Monoclinic	28.0	17000	-	-22	609
2060	Zn(Nb <sub>0.35</sub> Ta <sub>0.65</sub> ) <sub>2</sub> O <sub>6</sub>	1300	Columbite Orthorhombic Pbcn	28.0	50000		0	946
2061	0.5Ca <sub>2</sub> AlNbO <sub>6</sub> -0.5Ca <sub>3</sub> Nb <sub>2</sub> O <sub>8</sub>		Mixture phases	28.0	8900	6.86	36	864
2062	MgTa <sub>2</sub> O <sub>6</sub> +0.5 wt% CuO	1400	Trirutile structure Tetragonal P4 <sub>2</sub> /mmm	28.0	58000		18	947
2063	Zn <sub>0.4</sub> Co <sub>0.6</sub> TiO <sub>3</sub>	1200	Spinel+rutile	28.0	70000			948
2064	Pr(Mg <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub>	1650/2h	Perovskite	28.0	27800	10	-17	702
2065	Ba <sub>5</sub> Ta <sub>4</sub> O <sub>15</sub> (A <sub>n</sub> B <sub>n-1</sub> O <sub>3n</sub> )	1550	Trigonal P-3m1 perovskite	28.0	31600	5.55	12	325,851
2066	3CaO-2CoO-Ta <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1400	Mixture	28.0	19500	4.8	-14	230
2067	0.75(Al <sub>1/2</sub> Ta <sub>1/2</sub> O <sub>2</sub> )-0.25(Ti <sub>0.85</sub> Sn <sub>0.15</sub> )O <sub>2</sub>	1450/3h	Composite	28.0	68000		0	949
2068	(1-x)LaMg <sub>1/2</sub> Ti <sub>1/2</sub> O <sub>3</sub> -xLa <sub>2/3</sub> TiO <sub>3</sub> (x=0.1)		Perovskite	28.0	56000	6.6	-66	950
2069	(1-x)Sr(Li <sub>1/4</sub> Nb <sub>3/4</sub> )O <sub>3</sub> -xSr(Li <sub>2/3</sub> W <sub>3/5</sub> )O <sub>3</sub> (x=0.283)	1450	Provskite Monoclinic P2 <sub>1</sub> /c	28.0	23800	9.1	30	951
2070	Ba <sub>8</sub> Li <sub>2</sub> Ta <sub>6</sub> O <sub>24</sub>		Hexagonal P6 <sub>3</sub> mmc	28.0	103600		-29	952
2071	MgZr <sub>1.32</sub> Nb <sub>2</sub> O <sub>8.64</sub>	1320/6h	Wolframite	28.0	68600		1	953
2072	La <sub>5</sub> AlTi <sub>3</sub> O <sub>15</sub>	1600	Hexagonal perovskite	28.1	28600	3.4	-39	954
2073	0.09[0.5ZnNb <sub>2</sub> O <sub>6</sub> -0.5Zn <sub>3</sub> Nb <sub>2</sub> O <sub>8</sub> ]-0.91ZnTa <sub>2</sub> O <sub>6</sub> +5 wt% ZBS	900	Composite	28.1	32800		-8	955
2074	Ba(Zn <sub>1/2</sub> W <sub>1/2</sub> )O <sub>3</sub>	1340	Perovskite Cubic Fm3m	28.1	22700	8		432
2075	Al <sub>2</sub> O <sub>3</sub> -TiO <sub>2</sub> -Ta <sub>2</sub> O <sub>5</sub>	1575	Composite	28.1	1000		20	583
2076	SrHfO <sub>3</sub>	1750	Cubic Pm3m	28.1	33500	9.3	-63	850
2077	Ba(Ti <sub>0.5</sub> Mn <sub>0.5</sub> )O <sub>3</sub> +5 wt% Li <sub>2</sub> CO <sub>3</sub>	1200	Perovskite Hexagonal	28.1	5300		35	956
2078	Li <sub>2</sub> Cu <sub>0.2</sub> Mg <sub>0.8</sub> Ti <sub>3</sub> O <sub>8</sub>	950	Cubic P4 <sub>3</sub> 32	28.1	34300		9	957

2079	Ba[Ti <sub>1-x</sub> (Zn <sub>1/2</sub> W <sub>1/2</sub> ) <sub>x</sub> ]O <sub>3</sub> (x=1)	1380	Cubic perovskite Fm3 <sup>-</sup> m	28.2	15200	-16	695	
2080	Ba <sub>10</sub> Mg <sub>0.25</sub> Ta <sub>7.9</sub> O <sub>30</sub>	1600/12h	Hexagonal P6 <sub>3</sub> mc	28.2	33500	29	958	
2081	Sr(Dy <sub>0.5</sub> Ta <sub>0.5</sub> )O <sub>3</sub> +0.5 wt% Nb <sub>2</sub> O <sub>5</sub>	1600/4h	Complex perovskite tetragonal	28.2	34200	-73	859	
2082	Ca(Ho <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1600/4h	Complex perovskite Monoclinic P2 <sub>1</sub> /n	28.2	23700	-8	750	
2083	BaTa <sub>2</sub> V <sub>2</sub> O <sub>11</sub>	870	Rhombohedral R-3m	28.2	41950	91	336	
2084	La(Zn <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> (sol gel)		Perovskite	28.3	66500		959	
2085	La <sub>2</sub> Ti <sub>2</sub> SiO <sub>9</sub>	1325	Monoclinic C2/m	28.3	29500	23	960	
2086	Ba(Zn <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>3</sub> +1 wt% V <sub>2</sub> O <sub>3</sub>	1600	Perovskite Trigonal P-3m1	28.4	236000		961	
2087	Li <sub>2</sub> Mg <sub>0.95</sub> Ca <sub>0.05</sub> Ti <sub>3</sub> O <sub>8</sub>	1075/4h	Ternary spinel cubic P4 <sub>3</sub> 32	28.4	40000	14	858	
2088	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>0.75</sub> Ti <sub>0.25</sub> ]O <sub>3-d</sub> +12 wt% LMZBS glass	920/4h	Perovskite	28.4	11000	4.8	-3	792
2089	Ca[(Li <sub>1/3</sub> Ta <sub>2/3</sub> ) <sub>0.8</sub> Ti <sub>0.2</sub> ]O <sub>3-d</sub> +3 wt% B <sub>2</sub> O <sub>3</sub>	1050	Perovskite	28.4	12900	9.9	-15	765
2090	Sr <sub>6</sub> Ta <sub>4</sub> ZrO <sub>18</sub> +3 wt% Bi <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub> glass	1625/2h		28.4	9100		-39	895
2091	ZnZrNb <sub>2</sub> O <sub>8</sub> +3 wt% BaCu(B <sub>2</sub> O <sub>5</sub> )	950/4h	Monoclinic	28.4	56700		-53	962
2092	Ba <sub>3</sub> MgNb <sub>2-x</sub> Sb <sub>x</sub> O <sub>9</sub> (x=0.125)		Perovskite Trigonal P-3m1	28.5	101300	4.7	14	381
2093	0.8(Mg <sub>0.5</sub> Zn <sub>0.4</sub> ) <sub>0.95</sub> Co <sub>0.05</sub> TiO <sub>3</sub> -0.2Ca <sub>0.61</sub> Nd <sub>0.26</sub> TiO <sub>3</sub>	1250	Mixed phases	28.6	80600		4	963
2094	TeO <sub>2</sub> +10 wt% CaTiO <sub>3</sub>	645	Composite	28.7	15600		-3	444
2095	0.6[0.7ZnNb <sub>2</sub> O <sub>6</sub> -0.3Zn <sub>3</sub> Nb <sub>2</sub> O <sub>8</sub> ]-0.4TiTe <sub>3</sub> O <sub>8</sub>	670	Composite	28.7	5700		3	964
2096	(Mg <sub>0.95</sub> Ni <sub>0.05</sub> )Ta <sub>2</sub> O <sub>6</sub>	1525	Tetragonal P4 <sub>2</sub> /mmm	28.7	88300		45	965
2097	(Pb <sub>1-3x/2</sub> La <sub>x</sub> )(Mg <sub>1/2</sub> W <sub>1/2</sub> )O <sub>3</sub> (x=0.56)	1200	Perovskite Orthorhombic	28.7	18100		-6	966
2098	Li <sub>2</sub> Mg <sub>0.96</sub> Zn <sub>0.04</sub> Ti <sub>3</sub> O <sub>8</sub>	1200	Cubic Spinal	28.7	151200		-3	896
2099	Sr(Tb <sub>0.5</sub> Ta <sub>0.5</sub> )O <sub>3</sub> +0.5 wt% Nb <sub>2</sub> O <sub>5</sub>	1600/4h	Complex perovskite Tetragonal	28.8	46200		-70	859
2100	Mg <sub>0.3</sub> Co <sub>0.7</sub> Ta <sub>2</sub> O <sub>6</sub>	1500/2h	Tetragonal P4 <sub>2</sub> /mmm	28.8	22900		34	967
2101	Li <sub>2</sub> CoTi <sub>3</sub> O <sub>8</sub>	1025	Cubic spinel P4 <sub>3</sub> 32	28.9	52600		7	968
2102	Ba <sub>8</sub> Ta <sub>6</sub> ZnO <sub>24</sub>		Hexagonal P6 <sub>3</sub> cm	28.9	85000		40	785
2103	SmTaTi <sub>0.6</sub> Zr <sub>0.4</sub> O <sub>6</sub>			28.9	38320		-12	671
2104	0.7LaAlO <sub>3</sub> -0.3SrTiO <sub>3</sub>	1680	Composite	28.9	120000	9.9	-44	832
2105	Zn <sub>0.95</sub> Ni <sub>0.05</sub> ZrNb <sub>2</sub> O <sub>8</sub>			29.0	83600		-49	969

(continued)



No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
2106	$\text{Ca}(\text{Co}_{1/3}\text{Nb}_{2/3})\text{O}_3$		Complex perovskite Orthorhombic	29.0	6200	–	–65	609
2107	$\text{BaO-TiO}_2\text{-WO}_3$ (N-35): $\text{ZnO-B}_2\text{O}_3$	1100	Composite	29.0	7000	5.8	–	786,862
2108	$\text{CoTa}_2\text{O}_6$	1500	Trirutile Tetragonal $\text{P4}_2/\text{mmm}$	29.0	2300		23	600
2109	$\text{La}(\text{Mg}_{1/2}\text{Ti}_{1/2})\text{O}_3$	1650/2h	Perovskite Monoclinic $\text{P2}_1/\text{n}$	29.0	114000		–81	933
2110	$\text{Ba}(\text{Zn}_{1/2}\text{Ta}_{2/3})\text{O}_3 + 0.3 \text{ mol\% Ta}_2\text{O}_5$	1620/10h	Complex perovskite Trigonal $\text{P-3m1}$	29.0	152000			162
2111	$0.95 \text{ Ba}(\text{Zn}_{1/2}\text{Ta}_{2/3})\text{O}_3 - 0.05\text{Sr}(\text{Ga}_{1/2}\text{Ta}_{1/2})\text{O}_3$	1550/2h, 1450/24h	Perovskite	29.0	162000		0	970,971
2112	$\text{Ba}_3(\text{Zr}_{0.0645}\text{Zn}_{0.816}\text{Ni}_{0.1625}\text{Ta}_{1.957})\text{O}_9$	1510/24h	Complex perovskite Trigonal $\text{P-3m1}$	29.0	126860		–2	972
2113	$\text{Sr}(\text{Tb}_{1/2}\text{Ta}_{1/2})\text{O}_3$	1600/4h	Perovskite	29.0	34200		–70	861
2114	$3\text{CaO-2NiO-Ta}_2\text{O}_5\text{-TiO}_2$	1500	Composite	29.0	18800	4.9	–33	230
2115	$2\text{CaO-3CoO-Ta}_2\text{O}_5\text{-TiO}_2$	1175	Composite	29.0	18500	4.9	–28	230
2116	$\text{La}_{10}\text{MgTi}_9\text{O}_{34}$		Perovskite slab series	29.0	13000	5.9	–22	950
2117	$\text{BaTiTe}_3\text{O}_9$	650		29.0	1700	7.6	–372	973
2118	$(1-x)\text{Ca}(\text{Li}_{1/4}\text{Nb}_{3/4})\text{O}_3 - x\text{Ca}(\text{Li}_{2/3}\text{W}_{3/5})\text{O}_3$ ( $x=0.333$ )	1150	Provskite Trigonal $\text{P2}_1/\text{c}$	29.0	15700	9.7	–35	951
2119	$(\text{Sr}_{2/3}\text{La}_{1/3})(\text{Li}_{1/3}\text{Nb}_{2/3})\text{O}_3$	1300	Not available	29.0	6300	8.9	–76	824
2120	$\text{CeO}_2 + 0.06\text{CaTiO}_3$	1650/2h	Cubic flurite $\text{Fm3m}$	29.0	25000		0	525
2121	$\text{La}(\text{Mg}_{1-x}\text{Zn}_x)_{1/2}\text{Ti}_{1/2}\text{O}_3$ ( $x=0.3$ )	1475/4h	Perovskite Cubic $\text{Pa3}$	29.0	74000		–63	974
2122	$\text{Sr}_{4-m}\text{La}_m\text{Ti}_{m-1}\text{Ta}_{4-m}\text{O}_{12}$ ( $m=1$ )	1560	Cation deficient Hexagonal perovskite	29.0	16050		–43	975
2123	$\text{Mg}(\text{Nb}_{0.7}\text{Ta}_{1.3})\text{O}_6$		Columbite	29.0	67800		1	976
2124	$\text{Ba}_8\text{Ga}_{0.8}\text{Ta}_{5.92}\text{O}_{24}$	1450/24h	Hexagonal $\text{P6}_3\text{cm}$	29.0	29000		11	952
2125	$\text{Ba}_8\text{CoTa}_6\text{O}_{24}$		Hexagonal $\text{P6}_3\text{cm}$	29.0	69400			952
2126	$\text{Ba}_8\text{CuTa}_6\text{O}_{24}$		Hexagonal $\text{P6}_3\text{cm}$	29.0	8600			952
2127	$0.5\text{CeO}_2 - 0.25\text{MnO} - 0.25\text{TiO}_2 : 0.4 \text{ Sb}_2\text{O}_3$	1200	Composite	29.1	7000	4.9221	–1	488
2128	$\text{Ba}(\text{Zn}_{1/2}\text{W}_{1/2})\text{O}_3$	1330	Perovskite cubic $\text{Fm3m}$	29.1	36000	6.8	–31	528
2129	$\text{La}(\text{Mg}_{1-x}\text{Co}_x)_{1/2}\text{TiO}_3$ ( $x=1$ ) + 1 wt% $\text{ZnO}$	1375/4h	Perovskite	29.1	80000		–59	977

2130	BaHfO <sub>3</sub>	1750	Cubic perovskite Pm3m	29.1	5400	8.85	111	850
2131	Zn <sub>0.95</sub> Mg <sub>0.05</sub> ZrNb <sub>2</sub> O <sub>8</sub>			29.1	81200			969
2132	Ca <sub>2</sub> Mg <sub>3</sub> (Nb <sub>1.75</sub> Sb <sub>0.25</sub> )TiO <sub>12</sub>	1250	Mixture phases	29.2	18800		-22	843
2133	Pr <sub>2</sub> Ti <sub>2</sub> SiO <sub>9</sub>	1325	Monoclinic C2/m	29.2	33700		20	960
2134	0.9La(Mg <sub>1/3</sub> Ti <sub>1/3</sub> )O <sub>3</sub> -0.1SrTiO <sub>3</sub>		Perovskite Pbnm	29.2	14500	7.33		978
2135	0.9Nd(Co <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> -0.1SrTiO <sub>3</sub>	1440/4h	Perovskite mixtures	29.3	80900		0	979
2136	Ba <sub>6</sub> Ta <sub>4</sub> TiO <sub>18</sub>	1550/2h	Not available	29.3	27500		45	895
2137	(1-x)La(Mg <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> -xLa <sub>2/3</sub> TiO <sub>3</sub> (x=0.3)		Perovskite Orthorhombic Pnma	29.3	6500	8.3		889
2138	Sm(Mg <sub>0.5</sub> Ti <sub>0.5</sub> )O <sub>3</sub> +10 mol% Bi <sub>2</sub> O <sub>3</sub>	1300	Composite	29.3	26300	8.84	-33	898
2139	Mg <sub>0.7</sub> Co <sub>0.3</sub> Ta <sub>2</sub> O <sub>6</sub>	1500/2h	Tetragonal P4 <sub>2</sub> /mmm	29.3	45700		40	967
2140	SrYb <sub>1/2</sub> Nb <sub>1/2</sub> O <sub>3</sub> +0.2 wt% B <sub>2</sub> O <sub>3</sub>	1350/4h	Complex perovskite Orthorhombic	29.3	30600		-75	823
2141	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>0.95</sub> Zr <sub>0.15</sub> ]O <sub>3+d</sub> +5 wt% Li <sub>2</sub> O-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -CaO-Al <sub>2</sub> O <sub>3</sub> glass	940	Perovskite	29.4	5400		-25	980
2142	Sr(Yb <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1500	Perovskite Hexagonal	29.4	50000	8.1	-72	590
2143	0.8(Al <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>2</sub> -0.2TiO <sub>2</sub>	1450/3h	Tetragonal	29.4	75470		0	981
2144	Ca[(Li <sub>1/3</sub> Ta <sub>2/3</sub> ) <sub>0.85</sub> Ti <sub>0.15</sub> ]O <sub>3-d</sub> +3 wt% B <sub>2</sub> O <sub>3</sub>	1050/4h	Perovskite	29.4	20700	10.47	-57	765
2145	Ba <sub>6</sub> Ti <sub>1-x</sub> Sn <sub>x</sub> Nb <sub>4</sub> O <sub>18</sub> (x=1)	1530	Trigonal R-3m	29.5	28500	6.06	0	982
2146	Sr(Gd <sub>0.5</sub> Ta <sub>0.5</sub> )O <sub>3</sub> +0.5 wt% Nb <sub>2</sub> O <sub>5</sub>	1600/4h	Complex perovskite Tetragonal	29.5	4000		-66	859
2147	BaZn <sub>1.98</sub> Cu <sub>0.02</sub> Ti <sub>4</sub> O <sub>11</sub>	1190/2h	Orthorhombic Pbcn	29.5	51400		-34	983
2148	0.85(Mg <sub>0.7</sub> Zn <sub>0.3</sub> ) <sub>0.95</sub> Co <sub>0.05</sub> TiO <sub>3</sub> -0.15Ca <sub>0.8</sub> Sm <sub>0.4/3</sub> TiO <sub>3</sub>		Composite	29.5	65000	9	1	984
2149	ZnZrNb <sub>2</sub> O <sub>8</sub>			29.5	61000		-53	969
2150	Pr <sub>x</sub> Y <sub>1-x</sub> TiTaO <sub>6</sub> (x=0.23)	1600		29.6	41000		5	985
2151	Zn <sub>0.95</sub> Co <sub>0.05</sub> ZrNb <sub>2</sub> O <sub>8</sub>			29.6	60500			969
2152	0.94CoNb <sub>2</sub> O <sub>6</sub> -0.06TiO <sub>2</sub>	1150	Composite	29.6	20300		4	545
2153	0.78ZnNb <sub>2</sub> O <sub>6</sub> -0.22TiO <sub>2</sub>	1200	Composite	29.6	27700		22	545
2154	Ca[Li <sub>1/3</sub> Nb <sub>2/3</sub> ]O <sub>3</sub>	1150/3h	Perovskite	29.6	40000		-21	752
2155	Ca(In <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1550/4h	Complex perovskite Orthorhombic	29.6	37900		-33	763
2156	La(Mg <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> +1 wt% CuO	1450	Perovskite P2 <sub>1</sub> /n	29.6	33800		-68	986

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No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
2157	$\text{Sr}(\text{Nd}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1500	Perovskite	29.7	2500	8.1	-32	590
2158	$\text{SmTaTi}_{0.5}\text{Zr}_{0.5}\text{O}_6$			29.7	32173		-21	671
2159	$\text{Ba}_{10}\text{Co}_{0.25}\text{Ta}_{7.9}\text{O}_{30}$	1600/24h	Hexagonal $\text{P6}_3\text{mc}$	29.7	36700		29	865
2160	$0.23\text{BaWO}_4\text{-}0.77\text{Ba}_5\text{Nb}_4\text{O}_{15}$	1100	Composite	29.7	44600		28	485
2161	$(1-y)\text{Li}_{2.02}\text{Ti}_{0.92}\text{Nb}_{0.06}\text{O}_3$ ( $y=0.4$ )	1070		29.8	10000		24	722
2162	$\text{Mg}_{0.93}\text{Co}_{0.07}\text{Ta}_2\text{O}_6$	1500/2h	Tetragonal $\text{P4}_2/\text{mmm}$	29.8	68200		42	967
2163	$\text{Ca}[(\text{Li}_{1/3}\text{Nb}_{2/3})_{0.9}\text{Zr}_{0.1}]\text{O}_{3-d}$	1150	Perovskite	29.8	36300		-5	987
2164	$\text{Ba}[\text{Ti}_{1-x}(\text{Ni}_{1/2}\text{W}_{1/2})_x]\text{O}_3$ ( $x=0.4$ )	1425	Perovskite Hexagonal $\text{P6}_3/\text{mmc}$	29.8	26700		7	695
2165	$0.9\text{La}(\text{Mg}_{1/2}\text{Ti}_{1/2})\text{O}_3\text{-}0.1\text{CaTiO}_3$	1600	Perovskite $\text{P2}_1/\text{n}$	29.8	16700	6.9	-70	932
2166	$\text{La}(\text{Co}_{1/2}\text{Ti}_{1/2})\text{O}_3\text{+}0.25 \text{ wt\% CuO}$	1380	Orthorhombic $\text{Pnm}_{21}$	29.8	64000	8	-56	988
2167	$\text{NdNbO}_4$	1150	Fergusonite	29.8	49000		53	989
2168	$\text{Zn}_{0.95}\text{Mn}_{0.05}\text{ZrNb}_2\text{O}_8$			29.8	59800		-40	969
2169	$\text{Ba}_3\text{YNb}_3\text{O}_{12}$	1450		29.9	39500		24	990
2170	$\text{Ca}[(\text{Li}_{1/3}\text{Nb}_{2/3})_{1-x}\text{Zr}_x]\text{O}_3$ ( $x=0.05$ )	1150	Perovskite orthorhombic	29.9	46300		-20	733
2171	$\text{La}(\text{Mg}_{1-x}\text{Zn}_x)_{1/2}\text{Ti}_{1/2}\text{O}_3\text{+}1 \text{ wt\% B}_2\text{O}_3$	1475	Perovskite Cubic $\text{Pa}3$	30.0	74000		-63	991
2172	$7\text{Bi}_2\text{O}_3\text{-MoO}_3$	820	Composite	30.0	1900		-20	494
2173	$\text{Ca}(\text{Dy}_{1/2}\text{Ta}_{1/2})\text{O}_3$	1600/4h	Complex perovskite Monoclinic $\text{P2}_1/\text{n}$	30.0	26500		-6	750
2174	$\text{ZnZrNb}_2\text{O}_8$	950	Monoclinic $\text{P2}/\text{c}$	30.0	61000		-52	992
2175	$\text{Ba}(\text{Yb}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1700	Complex perovskite Orthorhombic	30.0	16500	8.7	118	590
2176	$\text{Nb}_2\text{O}_5\text{-Zn}_{0.95}\text{Mg}_{0.05}\text{TiO}_3\text{+}0.25\text{TiO}_2\text{+}5 \text{ wt\% Bi}_2\text{O}_3$	960	Composite	30.0	12000		-12	993
2177	$\text{Ba}_4\text{LiNb}_{3-x}\text{Ta}_x\text{O}_{12}$ ( $x=2$ )	1400	Hexagonal perovskite	30.0	37500		34	941
2178	$\text{Sr}(\text{Al}_{1/2}\text{Nb}_{1/2})\text{O}_3\text{+}0.2 \text{ wt\% B}_2\text{O}_3$	1350/4h	Complex perovskite	30.0	22500		-2	823
2179	$\text{La}_4\text{Ba}_2\text{Ti}_5\text{O}_{18}\text{+B}_2\text{O}_3$		Hexagonal $\text{R}$	30.0	20000		55	994
2180	$\text{Ba}(\text{Zn,Ta})\text{O}_3\text{-Ba}(\text{Zn,Nb})\text{O}_3$		Complex perovskite Trigonal $\text{P-}3\text{m}1$	30.0	164000	12	0	903
2181	$\text{Ba}(\text{Ca}_{1/3}\text{Ta}_{2/3})\text{O}_3$		Perovskite Hexagonal	30.0	27400	7	145	701
2182	$\text{BaNb}_2\text{O}_6$	1300	Orthorhombic $\text{C}222_1$	30.0	43000		-45	995
2183	$\text{Pb}_{0.5}\text{Ca}_{0.5}(\text{Al}_{1/2}\text{Nb}_{1/2})\text{O}_3$		Perovskite	30.0	1500	5.1	-23	996

2184	CaZrO <sub>3</sub>		Perovskite Pcmn Orthorhombic	30.0	26400	11	-27	997,998
2185	SrZrO <sub>3</sub>		Perovskite Orthorhombic Pcmn	30.0	13600	11	-67	997,998
2186	La(Co <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub>	1440/6h	Perovskite Orthorhombic Pnm2 <sub>1</sub>	30.0	67000	10	-64	819
2187	Ba <sub>8</sub> Li <sub>2</sub> Nb <sub>2</sub> Ta <sub>4</sub> O <sub>24</sub>		Hexagonal P6 <sub>3</sub> mmc	30.0	37500			952
2188	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>0.9</sub> Zr <sub>0.1</sub> ]O <sub>3-δ</sub>	1150	Perovskite	30.0	36300		-5	999
2189	(1-x)Sr(Li <sub>1/4</sub> Nb <sub>3/4</sub> )O <sub>3</sub> -xSr(Li <sub>2/5</sub> W <sub>3/5</sub> )O <sub>3</sub> (x=0.385)	1450	Provskite monoclinic P2 <sub>1</sub> /c	30.0	21200		-33	951
2190	(1-x)Ca(Li <sub>1/4</sub> Nb <sub>3/4</sub> )O <sub>3</sub> -xCa(Li <sub>2/5</sub> W <sub>3/5</sub> )O <sub>3</sub> (x=0.238)	1150	Perovskite	30.0	22700		-33	951
2191	ZnTiO <sub>3</sub> +0.25TiO <sub>2</sub> +1 wt% B <sub>2</sub> O <sub>3</sub>	875/4h	Mixture	30.0	56000		10	1000
2192	Sm <sub>0.8</sub> Y <sub>0.2</sub> TiNbO <sub>6</sub>	1400	Orthorhombic Pbnm	30.0	11000		17	564
2193	Ba <sub>5</sub> Ta <sub>4</sub> O <sub>15</sub>	1550/40h	Hexagonal perovskite	30.0	31600		12	325
2194	Bi <sub>2</sub> ZnNb <sub>2</sub> O <sub>9</sub> +ZnNb <sub>2</sub> O <sub>6</sub> +3 wt% PbO-Bi <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub> -ZnO-TiO <sub>2</sub> glass	900	Composite	30.0	3500	6		1001
2195	Ba <sub>2</sub> Ti <sub>9</sub> O <sub>20</sub> +9 wt% B <sub>2</sub> O <sub>3</sub>	1050/2h	Monoclinic P2 <sub>1</sub> /m	30.0	13700		6	1002
2196	Ba(Zn <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>3</sub> +1 mol% Mn	1550	Perovskite Trigonal P-3m1	30.0	145000		0	787
2197	Ba <sub>3</sub> [Zr <sub>0.09</sub> Ni <sub>0.125</sub> Zn <sub>0.845</sub> Ta <sub>1.94</sub> ]O <sub>3</sub>	1520/48h	Perovskite Trigonal P-3m1	30.0	138710		-1	945
2198	Ba(Zr <sub>0.05</sub> Zn <sub>0.32</sub> Ta <sub>0.63</sub> )O <sub>3</sub>	1500/4h	Complex perovskite Trigonal P-3m1	30.0	148000		8	1003
2199	0.15TiTe <sub>3</sub> O <sub>8</sub> -0.85TeO <sub>2</sub>	700	Composite	30.0	22000	5	0	586
2200	BaO-CeO <sub>2</sub> -TiO <sub>2</sub> +1.5 wt% CuO	1050	Composite	30.0	32000		-11	366
2201	Ca <sub>1-x</sub> Nd <sub>2x/3</sub> )TiO <sub>3</sub> +3ZnO-2B <sub>2</sub> O <sub>3</sub> glass (20-40 mol%)	880	Perovskite Tetragonal	30- 60	200- 5500		20-60	1004
2202	3CaO-2MgO-Ta <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1550	Composite	30.0	185000	4.6	-24	230
2203	La(Zn <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> sol-gel	1350	Perovskite Orthorhombic	30.0	60000		-71	1005
2204	Ca(Yb <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1550/4h	Complex perovskite Orthorhombic	30.0	32500		-25	763
2205	Sr(Eu <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1600/4h	Complex perovskite	30.0	45500		-43	861
2206	Sr(Gd <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1600/4h	Complex perovskite	30.0	4000		-66	861
2207	Ca(Dy <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1600/4h	Complex perovskite	30.0	26500		-6	750
2208	BaZn <sub>2</sub> Ti <sub>4</sub> O <sub>11</sub>	1200	Orthorhombic Pbcn	30.0	68000		-30	1006

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
2209	Ba <sub>5</sub> SrTa <sub>4</sub> ZrO <sub>18</sub> +2 wt% Bi <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub> glass	1525/4h	Trigonal R-3m	30.0	18500		37	895
2210	BaZn <sub>1.95</sub> Ti <sub>4</sub> O <sub>10.95</sub>	1200	Orthorhombic Pbcn	30.0	110000			1006
2211	La(Co <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> +0.25 wt% B <sub>2</sub> O <sub>3</sub>	1350/6h	Perovskite	30.0	64600	8	-48	1007
2212	(1-x)Sr(Li <sub>1/4</sub> Nb <sub>3/4</sub> )O <sub>3</sub> -xSr(Li <sub>2/5</sub> W <sub>3/5</sub> )O <sub>3</sub> (x=0.385)	1450	Perovskite	30.0	21200	9.2	-33	951
2213	(Ca <sub>2/3</sub> La <sub>1/3</sub> )(Li <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub>	1250	Monoclinic P2 <sub>1</sub> /c	30.0	26500	8.7	-26	824
2214	(1-x)CaTiO <sub>3</sub> -xSm(Mg <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> (x=0.8)		Orthorhombic Pnm1 Perovskite	30.0	13000		-20	1008
2215	BaZn <sub>2-x</sub> Ti <sub>4</sub> O <sub>11-x</sub> (x=0-0.1)	1250/4h	Orthorhombic Pbcn	30.0	83000		-30	1006
2216	Ba <sub>10</sub> Co <sub>0.25</sub> Ta <sub>7.9</sub> O <sub>30</sub>	1550	P6 <sub>3</sub> mc	30.0	36700	3.78	29	958
2217	Sr(Eu <sub>0.5</sub> Ta <sub>0.5</sub> )O <sub>3</sub> +0.5 wt% Nb <sub>2</sub> O <sub>5</sub>	1600/4h	Complex perovskite Tetragonal	30.0	45500		-63	859
2218	Nd <sub>5</sub> Ti <sub>4</sub> FeO <sub>17</sub>	1400	Monoclinic P21/b	30.0	7400		-104	911
2219	Ba <sub>6</sub> Ta <sub>4</sub> ZrO <sub>18</sub> +2 wt% Bi <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub> glass	1625/2h		30.1	41000		5	895
2220	La <sub>2</sub> O <sub>3</sub> -WO <sub>3</sub> -TiO <sub>2</sub>	1350	Multiphase	30.1	9225	5.8	-17	400
2221	Nd <sub>2</sub> Ti <sub>2</sub> SiO <sub>9</sub>	1300	Monoclinic C2/m	30.1	19600		10	960
2222	TeO <sub>2</sub> +15 wt% CaTiO <sub>3</sub>		Composite	30.1	21400		29	444
2223	MgTa <sub>2</sub> O <sub>6</sub> (Sol-gel)	1200	Columbite Tetragonal P4 <sub>2</sub> /mmm	30.1	57300		29	1009
2224	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>1-x</sub> Zr <sub>x</sub> ]O <sub>3</sub> (x=0.1)	1150	Perovskite Orthorhombic	30.1	36000		-5	733
2225	0.8Sm(Mg <sub>0.5</sub> Ti <sub>0.5</sub> )O <sub>3</sub> -0.2Ca <sub>0.8</sub> Sr <sub>0.2</sub> TiO <sub>3</sub>	1550/3h	Perovskite	30.1	115000		9	1010
2226	LiBiW <sub>2</sub> O <sub>8</sub> +30 mol% TiO <sub>2</sub>	700/2h	Composite	30.2	13000		-9	888
2227	La(Co <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> +0.75 wt% ZnO	1320	Perovskite	30.2	73000	8	-35	1011
2228	MWF-38+10 wt% Li <sub>2</sub> O-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> - (56.92:37.59:5.49)	875	Composite	30.2	9500		3	510
2229	BaLi <sub>2</sub> Ti <sub>6</sub> O <sub>14</sub> +0.5 wt% BaCu(B <sub>3</sub> O <sub>5</sub> )	920	Orthorhombic Cmca	30.2	28400		-18	1012
2230	MgTa <sub>2</sub> O <sub>6</sub>	1550	Tetragonal P4 <sub>2</sub> /mmm	30.3	59600		30	600
2231	ZnTa <sub>2</sub> O <sub>6</sub>	1400	Orthorhombic Pbcn	30.3	87580		9	1013
2232	Eu(Zr <sub>1/3</sub> Ti <sub>2/3</sub> )O <sub>6</sub>	1600	Aeschyenite Orthorhombic Pnma	30.4	11000	4.5	-4	1014
2233	Nd(Zn <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> +1.5 wt% CuO	1240	Complex perovskite Monoclinic	30.4	14000	8	-44	1015
2234	(AgBi) <sub>1/2</sub> MoO <sub>4</sub>	690	Tetragonal I4 <sub>1</sub> /a	30.4	12600	8.7	57	677
2235	Mg <sub>0.99</sub> Co <sub>0.01</sub> Ta <sub>2</sub> O <sub>6</sub>	1500/2h	Tetragonal P4 <sub>2</sub> /mmm	30.4	72500		44	967
2236	Eu(Zr <sub>1/3</sub> Ti <sub>2/3</sub> )O <sub>6</sub>	1600/4h	Aeschyenite Orthorhombic Pnma	30.4	11000		-4	1014

2237	Ba <sub>1-x</sub> La <sub>2x/3</sub> ZrO <sub>3</sub> (x=0.1)	1430/15h	Cubic Pm3m	30.4	9000	4.7	165	1016
2238	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>0.8</sub> Ti <sub>0.2</sub> ]O <sub>3-d</sub> +5 wt% LBS glass	950/4h	Complex perovskite Orthorhombic	30.5	14700	4.6	-18	792
2239	Ba(Y <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>		Complex perovskite	30.5	38500	9.4	135	1017
2239	Ba(Y <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>		Complex perovskite	30.5	38500	9.4	135	1017
2240	Sr(Al <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1600/4h	Complex perovskite	30.5	10800		-27	823
2241	0.09[0.5ZnNb <sub>2</sub> O <sub>6</sub> -0.5Zn <sub>3</sub> Nb <sub>2</sub> O <sub>8</sub> ]-0.91ZnTa <sub>2</sub> O <sub>6</sub> +3 wt% BBS	950	Composite	30.5	32600		-11	955
2242	Ba <sub>8</sub> ZnTa <sub>6</sub> O <sub>24</sub>	1400	Hexagonal perovskite	30.5	62000	8.9	36	818
2243	Sr(Sm <sub>0.5</sub> Ta <sub>0.5</sub> )O <sub>3</sub> +0.5 wt% Nb <sub>2</sub> O <sub>5</sub>	1600/4h	Complex perovskite Tetragonal	30.5	45200		-61	859
2244	Ca(Li <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3-d</sub> +4 wt% B <sub>2</sub> O <sub>3</sub>	1000	Perovskite orthorhombic	30.6	31000		-18	1018
2245	MgTa <sub>2</sub> O <sub>6</sub>	1550	Tetragonal P4 <sub>2</sub> /mmm	30.6	58200		29	926
2246	Mg <sub>0.97</sub> Co <sub>0.03</sub> Ta <sub>2</sub> O <sub>6</sub>	1500/2h	Tetragonal P4 <sub>2</sub> /mmm	30.6	89000		43	967
2247	Sr(Ho <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> +0.2 wt% B <sub>2</sub> O <sub>3</sub>	1350/4h	Perovskite Tetragonal	30.6	16650		-66	823
2248	Sr(Y <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> +0.2 wt% B <sub>2</sub> O <sub>3</sub>	1350/4h	Complex perovskite Orthorhombic	30.7	42500		-67	823
2249	Mg <sub>0.95</sub> Co <sub>0.05</sub> Ta <sub>2</sub> O <sub>6</sub>	1500/2h	Tetragonal P4 <sub>2</sub> /mmm	30.7	106200		43	967
2250	Sr(Yb <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> +0.5 wt% CeO <sub>2</sub>	1600/4h	Complex perovskite Orthorhombic Pnma	30.7	26600		-73	823
2251	Nd(Zn <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> +1 wt% CuO	1270	Complex perovskite Monoclinic	30.7	158000	8	-45	1015
2252	Ca(Fe <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>		Complex perovskite	30.7	3000	5.38		1019
2253	Mg <sub>0.5</sub> Zn <sub>0.5</sub> TiNb <sub>2</sub> O <sub>8</sub>	1120/6h	Not available	30.7	66900		-4	1020
2254	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>0.8</sub> Ti <sub>0.2</sub> ]O <sub>3-d</sub> +5 wt% LMZBS	975	Complex perovskite Orthorhombic	30.7	22600		-18	792
2255	Sr <sub>6</sub> Ta <sub>4</sub> ZrO <sub>18</sub> +3 wt% Bi <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub>	1625/2h	A <sub>6</sub> B <sub>5</sub> O <sub>18</sub> type perovskite	30.8	5600		-19	895
2256	Nd(Zn <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> +0.75 wt% CuO	1300	Complex perovskite Monoclinic	30.8	147500	8	-45	1015
2257	Zn(Ti <sub>1-x</sub> Sn <sub>x</sub> )Nb <sub>2</sub> O <sub>8</sub>		Orthorhombic Pbcn	30.9	43500		-54	1021
2258	0.8Li <sub>2</sub> ZnTi <sub>3</sub> O <sub>8</sub> -0.2TiO <sub>2</sub>	1100	Ternary spinel cubic P4 <sub>3</sub> 32	30.9	56100		29	872

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	Qf (GHz)	$f_0$	$\tau_f$	Reference
2259	0.1BaTiO <sub>3</sub> -0.9La(Mg <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub>		Perovskite Pbnm	30.9	16330	8.29	-72	933
2260	Li <sub>0.774</sub> Zr <sub>0.057</sub> NbO <sub>3</sub>	1150	Orthorhombic Pnma	30.9	3550		-16	1022
2261	Ba <sub>3</sub> ZnNb <sub>2-x</sub> Sb <sub>x</sub> O <sub>9</sub> (x=0.75)		Perovskite Cubic Pm3m	30.9	23700	5	0	381
2262	Ba <sub>3</sub> ZnNb <sub>2-x</sub> Sb <sub>x</sub> O <sub>9</sub> (x=0.5)		Perovskite Cubic Pm3m	30.9	35620	5.3	-11	381
2263	0.85BaTi <sub>4</sub> O <sub>9</sub> -0.15BaZn <sub>2</sub> Ti <sub>4</sub> O <sub>11</sub> +11 wt% BaCu(B <sub>2</sub> O <sub>5</sub> )	900	Composite	30.9	20200		12	1023
2264	Ba <sub>1-x</sub> Ca <sub>x</sub> (Nd <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>		Perovskite Cubic Fm3m	30-42	25000-5000			1017
2265	Ba <sub>1-x</sub> Ca <sub>x</sub> (Y <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>		Perovskite	30-22				1017
2266	(1-x)LaMg <sub>1/2</sub> Ti <sub>1/2</sub> -xLa <sub>2/3</sub> TiO <sub>3</sub> (x=0.2)		Perovskite	31.0	43000	6.3	-54	950
2267	2CaO-3NiO-Nb <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1275	Composite	31.0	7500	4.3	-49	230
2268	(1-x)Sr(Li <sub>1/4</sub> Nb <sub>3/4</sub> )O <sub>3</sub> -xSr(Li <sub>2/3</sub> W <sub>3/5</sub> )O <sub>3</sub> (x=0.333)	1450	Perovskite monoclinic P2 <sub>1</sub> /c	31.0	27400	8.7	-23	951
2269	(Sr <sub>0.15</sub> Ba <sub>0.85</sub> )(Yb <sub>0.5</sub> Ta <sub>0.5</sub> )O <sub>3</sub>	1600/4h	Complex perovskite	31.0	32100		0	859
2270	(1-x)Ca(Li <sub>1/4</sub> Nb <sub>3/4</sub> )O <sub>3</sub> -xCa(Li <sub>2/3</sub> W <sub>3/5</sub> )O <sub>3</sub> (x=0.238)	1150	Provskite monoclinic P2 <sub>1</sub> /c	31.0	22700	10.3	-33	951
2271	(1-x)Ba(Li <sub>1/4</sub> Nb <sub>3/4</sub> )O <sub>3</sub> -xBa(Li <sub>2/3</sub> W <sub>3/5</sub> )O <sub>3</sub> (x=0.333)	1470	Perovskite Cubic P-3m1	31.0	19000	7.8	18	1024
2272	Sm(Zn <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub>	1310/2h	Perovskite Orthorhombic Pnm	31.0	37000	8	-19	1025
2273	Ba <sub>3</sub> Zn <sub>7</sub> Ti <sub>12</sub> O <sub>34</sub>	1150/4h		31.0	4300		-25	1026
2274	BaO-TiO <sub>2</sub> -WO <sub>3</sub> (N-35):5 wt% Al <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -B <sub>2</sub> O <sub>3</sub>	1100	Composite	31.0	5400	5.7	-	786,862
2275	Ba(Mg <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub> +2 mol% B <sub>2</sub> O <sub>3</sub> +10 mol% CuO	875	Perovskite composite	31.0	21500		21	1027
2276	0.5Ba(Mg <sub>1/2</sub> W <sub>1/2</sub> )O <sub>3</sub> -0.5BaTiO <sub>3</sub>		Perovskite composite	31.0	8200	-	125	373
2277	Ba <sub>8</sub> Zn(Nb <sub>6-x</sub> Sb <sub>x</sub> )O <sub>24</sub> (x=0.9)	1425		31.0	11550		21	503
2278	Bi <sub>2</sub> MoO <sub>6</sub>	750	Monoclinic P2 <sub>1</sub> /n	31.0	16700	6.4	-114	494
2279	(Zr <sub>0.8</sub> Sn <sub>0.2</sub> )TiO <sub>4</sub> +MnO <sub>2</sub>	1350/4h	Orthorhombic Pbcn	31.0	93000	9.3		1028
2280	3Bi <sub>2</sub> O <sub>3</sub> -2MoO <sub>3</sub>	820		31.0	1000		-41	494
2281	Mg <sub>4</sub> La <sub>2</sub> Ti <sub>5</sub> O <sub>17</sub>	1350/4h		31.0	15000		4	1029

2282	BaO-4.3TiO <sub>2</sub> -0.5ZnO+7 wt% BCB	900	Composite	31.0	18200		4	1030
2283	(Zn <sub>0.5</sub> Co <sub>0.5</sub> )TiO <sub>3</sub>	1150	Perovskite	31.0	60000		75	704
2284	0.75(Al <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>2</sub> -0.25(Ti <sub>1-x</sub> Sn <sub>x</sub> )O <sub>2</sub>	1450/3h	Composite	31-26	54600-70700		13 to -9	949
2285	0.95Ba(Zn <sub>1/2</sub> Ta <sub>2/3</sub> )O <sub>3</sub> -0.05[Sr <sub>0.25</sub> Ba <sub>0.75</sub> ](Ga <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1500	Perovskite	31.0	210000			971
2286	Ba <sub>3</sub> Zn <sub>7</sub> Ti <sub>12</sub> O <sub>34</sub>	1150/4h	Orthorhombic	31.0	4300	10	-25	1026
2287	Ba <sub>0.85</sub> Sr <sub>0.15</sub> (Y <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1600	Complex perovskite	31.0	32000		0	861
2288	Sr(La <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1600/4h	Complex perovskite	31.0	4500		-42	861
2289	Sr(Sm <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1600/4h	Complex perovskite	31.0	45200		-61	861
2290	Sr(Al <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1600/24h	Complex perovskite	31.0	10800		-27	823,1031
2291	Ca(Y <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1550/4h	Perovskite Orthorhombic	31.0	35000		-13	763
2292	Sr(Yb <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1600/4h	Complex perovskite	31.0	26600		-73	823
2293	Ca(Li <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub> -4 wt% B <sub>2</sub> O <sub>3</sub>	1000	Complex perovskite	31.0	31000		-18	1018
2294	0.4CaTiO <sub>3</sub> -0.6Sm(Mg <sub>0.5</sub> Ti <sub>0.5</sub> )O <sub>3</sub>	1550	Perovskite	31.0	12000	5.3	-28	865
2295	2CaO-3MgO-Nb <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1325	Composite	31.0	33000	4.6	-10	230
2296	Ca <sub>4</sub> MgTa <sub>2</sub> TiO <sub>12</sub>	1625	Perovskite	31.0	43000	4.7	-62	230
2297	Ba(Li <sub>1/4</sub> Nb <sub>3/4</sub> )O <sub>3</sub> -Ba(Li <sub>2/3</sub> W <sub>3/5</sub> )O <sub>3</sub>	1470	Perovskite Cubic	31.0	19000	7.8	18	1024
2298	Ca <sub>4</sub> NiTa <sub>2</sub> TiO <sub>12</sub>	1625	Perovskite Orthorhombic Pnma	31.0	40000	4.7	-26	230
2299	Ba(Ni <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub>	1400	Complex perovskite Cubic Pm3m	31.0	48000		-18	1032
2300	Ba(Mg <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub>	1350	Complex perovskite P-3m1 Hexagonal	31.0	46000		18	1033
2301	Ba <sub>4</sub> SrTa <sub>4</sub> O <sub>15</sub> (A <sub>n</sub> B <sub>n-1</sub> O <sub>3n</sub> )	1575	Trigonal P3m1 perovskite	31.1	9500	5.2	8	851
2302	Pr <sub>0.16</sub> Gd <sub>0.8</sub> TiNbO <sub>6</sub>	1400	Orthorhombic	31.1	3180		-8	564
2303	SrEr <sub>1/2</sub> Nb <sub>1/2</sub> O <sub>3</sub> +0.2 wt% B <sub>2</sub> O <sub>3</sub>	1350/4h	Complex perovskite Orthorhombic	31.1	38400		-71	823
2304	SmTaTi <sub>0.7</sub> Zr <sub>0.3</sub> O <sub>6</sub>			31.1	37481		-2	671
2305	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>1-x</sub> Zr <sub>x</sub> ]O <sub>3</sub> (x=0.3)	1150	Perovskite orthorhombic	31.1	27100		-15	733
2306	TeO <sub>2</sub> +12.5 wt% CaTiO <sub>3</sub>		Composite	31.2	14800		18	444
2307	ZnTa <sub>2</sub> O <sub>6</sub> +0.25 wt% CaF <sub>2</sub>	1225/4h	Orthorhombic Pbcn	31.3	73600	6.8	-7	1034
2308	0.5Ba(Mg <sub>1/2</sub> W <sub>1/2</sub> )O <sub>3</sub> -0.5BaTiO <sub>3</sub>	1500/6h	Perovskite Hexagonal	31.2	8200		125	373

(continued)



No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
2309	Sr(La <sub>0.5</sub> Ta <sub>0.5</sub> )O <sub>3</sub> +0.5 wt% Nb <sub>2</sub> O <sub>5</sub>	1600/4h	Rhombohedral R3m complex Perovskite	31.2	4500		-42	859
2310	Sr(Dy <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> +0.2 wt% B <sub>2</sub> O <sub>3</sub>	1350/4h	Complex perovskite Tetragonal	31.2	30300		-63	823
2311	0.75(Al <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>2</sub> -0.25TiO <sub>2</sub>	1450	Composite	31.2	54600		13	949
2312	Nd(Zr <sub>1/3</sub> Ti <sub>2/3</sub> )O <sub>6</sub>	1600	Aeschyenite Orthorhombic Pnma	31.4	15800	4.3	6	1014
2313	(Zr <sub>0.8</sub> Sn <sub>0.2</sub> )TiO <sub>4</sub> +10 wt% BaO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -Li <sub>2</sub> O-CuO	1050/4h	Orthorhombic Pbcn	31.4	32200		-1	515
2314	Nd(Zr <sub>1/3</sub> Ti <sub>1/3</sub> )O <sub>6</sub>	1600/4h	Aeschyenite Orthorhombic Pnma	31.4	15800		6	1014
2315	Ca(Ho <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1550/4h	Complex perovskite Orthorhombic	31.4	32000		3	763
2316	Bi[Sb <sub>1-x</sub> (Nb <sub>0.992</sub> V <sub>0.008</sub> ) <sub>x</sub> ]O <sub>4</sub> (x=0.2)		Monoclinic I2/c	31.4	8000		8	715
2317	Ba[Ti <sub>1-x</sub> (Zn <sub>1/2</sub> W <sub>1/2</sub> ) <sub>x</sub> ]O <sub>3</sub> (x=1)	1420	Cubic perovskite Fm3̄m	31.4	20900		-1	695
2318	0.9Ba(Zn <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>3</sub> -0.1BaTi <sub>4</sub> O <sub>9</sub>	1320	Perovskite Hexagonal Composite	31.5	68500	6	4	1035
2319	Ba[(Mg <sub>1-x</sub> Co <sub>x</sub> ) <sub>1/3</sub> Nb <sub>2/3</sub> ]O <sub>3</sub> (x=0.05)		Perovskite Trigonal P-3m1	31.5	45000		17	1036
2320	(Zr <sub>1-x</sub> Sn <sub>x</sub> )(Li <sub>1/3</sub> Nb <sub>3/4</sub> ) <sub>0.4</sub> Ti <sub>0.6</sub> O <sub>4</sub> (x=0.3)	1140	—	31.5	58300		-33	1037
2321	Sr(Nd <sub>0.5</sub> Ta <sub>0.5</sub> )O <sub>3</sub> +0.5 wt% Nb <sub>2</sub> O <sub>5</sub>	1600/4h	Complex perovskite Tetragonal	31.5	38500		-55	859
2322	(Li <sub>0.5</sub> Bi <sub>0.5</sub> )(W <sub>0.6</sub> Mo <sub>0.4</sub> )O <sub>4</sub>	620		31.5	8500	8.2	20	1038
2323	Nd(Zn <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub>	1330/4h	Perovskite Monoclinic	31.6	170000	8.5	-42	1039
2324	Sr(Sm <sub>0.5</sub> Ta <sub>0.5</sub> )O <sub>3</sub> +0.5 wt% Nb <sub>2</sub> O <sub>5</sub> 0.2 wt% TiO <sub>2</sub>	1600/4h	Complex perovskite Tetragonal	31.6	46400		-55	859
2325	SmTaTi <sub>0.8</sub> Zr <sub>0.2</sub> O <sub>6</sub>		Cubic Fd3m	31.7	30654		6	671
2326	(Zr <sub>0.8</sub> Sn <sub>0.2</sub> )TiO <sub>4</sub> +10 wt% BaO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -Li <sub>2</sub> O-CuO	1050/12h	Composite	31.7	29700		-2	1040
2327	Ba <sub>5</sub> NbTa <sub>3</sub> O <sub>15</sub> (A <sub>n</sub> B <sub>n-1</sub> O <sub>3n</sub> )	1500	Trigonal P3m1 perovskite	31.7	21500		16	851
2328	BaSr <sub>4</sub> Ta <sub>4</sub> O <sub>15</sub> (A <sub>n</sub> B <sub>n-1</sub> O <sub>3n</sub> )	1600	Trigonal P3m1 perovskite	31.7	2800	5.34	-60	851
2329	90 wt% BaTi <sub>4</sub> O <sub>9</sub> +10 wt% Li <sub>2</sub> O-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub>	875	Composite	31.7	9000		10	592
2330	Ba[(Mg <sub>1-x</sub> Co <sub>x</sub> ) <sub>1/3</sub> Nb <sub>2/3</sub> ]O <sub>3</sub> (x=0.8)		Perovskite	31.7	76900		3	1041
2331	BaLi <sub>2</sub> Ti <sub>6</sub> O <sub>14</sub>	1025	Orthorhombic Cmca	31.7	23300	7.3	-15	1012
2332	Sr(Sm <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1500	Complex perovskite Monoclinic P2 <sub>1</sub> /n	31.8	41000	8.1	-45	590

2333	Nd[(Co <sub>0.02</sub> Zn <sub>0.8</sub> ) <sub>1/2</sub> Ti <sub>1/2</sub> ]O <sub>3</sub>		Perovskite monoclinic	31.8	176000	9.0	-43	1042
2334	BaNb <sub>2</sub> P <sub>2</sub> O <sub>11</sub>	1150	Trigonal R3-c	31.8	24100		45	268
2335	(Zr <sub>1-x</sub> Sn <sub>x</sub> )(Li <sub>1/4</sub> Nb <sub>3/4</sub> ) <sub>0.4</sub> Ti <sub>0.6</sub> O <sub>4</sub> (x=0.3)		—	31.8	58300		-33	1043
2336	ZnTiNb <sub>2</sub> O <sub>8</sub> +2 wt% Li <sub>2</sub> O-ZnO-B <sub>2</sub> O <sub>3</sub>	875	Ixiolite	31.8	25000		-62	1044
2337	Ba[(Ni <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>1-x</sub> Zr <sub>x</sub> ]O <sub>3</sub> (x=0.1)	1650	Perovskite	31.8	36100		8	1045
2338	MBRT-90+10 wt% Li <sub>2</sub> O-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -CaO-Al <sub>2</sub> O <sub>3</sub> (28:27:30:5:10)	875	Composite	31.9	2200		20	510
2339	Ba(Mg <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub>		Complex perovskite Trigonal P-3m1	32.0	55500	10	33	787
2340	Sr(Pr <sub>0.5</sub> Ta <sub>0.5</sub> )O <sub>3</sub> +0.5 wt% Nb <sub>2</sub> O <sub>5</sub>	1600/4h	Complex perovskite Tetragonal	32.0	8400		-50	859
2341	Ba(Yb <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub> +0.5 wt% Nb <sub>2</sub> O <sub>5</sub>	1575	Complex perovskite	32.0	35850		112	845
2342	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>0.95</sub> Zr <sub>0.15</sub> ]O <sub>3+d</sub> +15 wt% ZnO-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> glass rit	940/4h	Perovskite orthorhombic	32.0	66400		-27	1046
2343	La <sub>6</sub> Mg <sub>0.913</sub> Ti <sub>4.04</sub> O <sub>18</sub>		Perovskite slab series	32.0	31000	6.1	-46	950
2344	Ca <sub>5</sub> Nb <sub>2</sub> Ti <sub>0.4</sub> Hf <sub>0.6</sub> O <sub>12</sub>	1675	Perovskite Orthorhombic Pnma	32.0	22000	4.5	±0.5	490
2345	Ba(Mg <sub>1/3-x</sub> Nb <sub>2/3</sub> )O <sub>3-δ</sub> (x=0.02)	1450	Complex perovskite Trigonal P-3m1	32.0	96000		30	1047
2346	Ba(Co <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub>	1400	Complex perovskite Trigonal P-3m1	32.0	78000		-12	1048,1049
2347	Ba(Yb <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1625/4h	Complex perovskite	32.0	35900		112	943
2348	Ca(Fe <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	—	Complex perovskite Orthorhombic Pbnm	32.0	20000		-61	609
2349	Ca(Er <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1550/4h	Complex perovskite	32.0	31800		-18	763
2350	Ca(Dy <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1550/4h	Complex perovskite Orthorhombic	32.0	32500		5	763
2351	Sr(Sm <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub> +0.2 wt% TiO <sub>2</sub>	1600	Complex perovskite	32.0	46400		-46	861
2352	Sr(Pr <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1600/4h	Complex perovskite	32.0	8400		-50	861
2353	Sr(Nd <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1600/4h	Complex perovskite	32.0	38500		-55	861
2354	Sr(Ho <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1600/4h	Complex Perovskite	32.0	20400		-65	823
2355	Sr(Y <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1600/4h	Complex Perovskite	32.0	38800		-66	823
2356	Sr(Er <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1575/4h	Complex perovskite	32.0	36100		-67	823

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No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
2357	BaO-2CeO <sub>2</sub> -5TiO <sub>2</sub>	1250	Composite	32.0	19100		41	909
2358	EuTiNbO <sub>6</sub>	1370	Orthorhombic Pbnm	32.0	17250	5.3	5	563
2359	5CaO-2Nb <sub>2</sub> O <sub>5</sub>	1500	Mixed phases	32.0	6500	6.48	-37	325
2360	BaTi <sub>4</sub> O <sub>9</sub> +10 wt% glass frit	875	Composite	32.0	9000		10	1050
2361	0.1(Na <sub>0.5</sub> La <sub>0.5</sub> )TiO <sub>3</sub> -0.9CeO <sub>2</sub>	1400	Mixed phases	32.0	8200		0	1051
2362	SrLi <sub>2</sub> Ti <sub>6</sub> O <sub>14</sub> +0.5 wt% BCB	900	Orthorhombic Cmca	32.0	12900		-5	1012
2363	3CaO-2CoO-Nb <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1400	Composite	32.0	15000	4.3	-18	230
2364	0.25Ca <sub>2</sub> AlNbO <sub>6</sub> -0.75Ca <sub>3</sub> Nb <sub>2</sub> O <sub>8</sub>		Mixture phases	32.0	7500	6.34	64	864
2365	ZnTa <sub>2</sub> O <sub>6</sub> /MgNb <sub>2</sub> O <sub>6</sub> /ZnTa <sub>2</sub> O <sub>6</sub> (6:1:6) Vf layered	–	Composite	32.0	82800		0	1052
2366	La <sub>5</sub> Ti <sub>4</sub> CrO <sub>17</sub>	1600/2h	Orthorhombic Pnnm	32.0	5700		-24	911
2367	Ba(Cd <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>3</sub> +B <sub>2</sub> O <sub>3</sub>	1350	Complex perovskite Cubic Pm3m	32.0	50000	2	80	1053
2368	Ca <sub>5</sub> Nb <sub>2</sub> Ti <sub>0.4</sub> Hf <sub>0.6</sub> O <sub>12</sub>	1675	Perovskite Orthorhombic Pnma	32.0	22000	4.458	≈0	490
2369	BaO-TiO <sub>2</sub> -WO <sub>3</sub> (N-35):5 wt% Al <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub>	1100	Composite	32.0	11000	5.6	–	862
2370	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>0.8</sub> Ti <sub>0.2</sub> ]O <sub>3-d</sub> +3 wt% LBS	1025	Complex perovskite orthorhombic	32.0	20000		-18	792
2371	SnTe <sub>3</sub> O <sub>8</sub>	700/15h	Cubic Ia3	32.0	13200	4		53
2372	La <sub>6</sub> Mg <sub>0.913</sub> Ti <sub>4.04</sub> O <sub>18</sub>			32.0	31000	6.1	-46	950
2373	Ba(Sn <sub>0.226</sub> Zn <sub>0.258</sub> Nb <sub>0.516</sub> )O <sub>3</sub>	1500	Perovskite Cubic Pm3m	32.0	97000		12	1054
2374	Ba(Zn <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub> +5 mol% B <sub>2</sub> O	900	Perovskite Cubic Pm3m	32.0	3500		20	1055
2375	Sr(Sm <sub>0.5</sub> Ta <sub>0.5</sub> )O <sub>3</sub> +0.5 wt% Nb <sub>2</sub> O <sub>5</sub> 0.25 wt% TiO <sub>2</sub>	1600/4h	Complex perovskite Tetragonal	32.1	38600		-46	859
2376	(Ca <sub>2</sub> Mg <sub>2.75</sub> Pb <sub>0.25</sub> )Nb <sub>2</sub> (Ti <sub>0.75</sub> Zr <sub>0.25</sub> )O <sub>12</sub>	1275		32.2	12250		-35	799
2377	Sr(Er <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> +0.5 wt% CeO <sub>2</sub>	1600/4h	Perovskite Orthorhombic	32.2	36100		-67	823
2378	Sr(Y <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> +0.5 wt% CeO <sub>2</sub>	1600/4h	Complex perovskite Orthorhombic	32.2	38850		-66	823
2379	Ba <sub>5</sub> Nb <sub>3</sub> TaO <sub>15</sub>	1435	Trigonal P-3m1 perovskite	32.2	4700	4.4	35	851
2380	Sr(Ho <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> +0.5 wt% CeO <sub>2</sub>	1600/4h	Complex perovskite Tetragonal	32.3	20400		-65	823

2381	Sr(Tb <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> +0.2 wt% B <sub>2</sub> O <sub>3</sub>	1350/4h	Complex perovskite Tetragonal	32.3	33500		-64	823
2382	Ba <sub>6</sub> Nb <sub>4</sub> ZrO <sub>18</sub>	1625/2h	A <sub>6</sub> B <sub>5</sub> O <sub>18</sub> type perovskite Trigonal R-3m	32.4	52000		25	895
2383	(Zr <sub>1-x</sub> Sn <sub>x</sub> )(Li <sub>1/4</sub> Nb <sub>3/4</sub> ) <sub>0.4</sub> Ti <sub>0.06</sub> O <sub>4</sub> (x=0.2)		Not available	32.4	50300		-24	1037
2384	Bi <sub>2</sub> W <sub>2</sub> O <sub>9</sub>	875	Orthorhombic Pbn21	32.5	7700	5.5	-63	1056
2385	(Sr <sub>0.05</sub> Ba <sub>0.95</sub> )(Y <sub>0.5</sub> Ta <sub>0.5</sub> )O <sub>3</sub>	1600/4h	Complex perovskite	32.5	47300		0	859
2386	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>0.8</sub> Ti <sub>0.2</sub> ]O <sub>3-d</sub> +5 wt% ZnB <sub>2</sub> O <sub>4</sub> glass	940	Perovskite Orthorhombic	32.5	20600		-26	1057
2387	0.6Ba(Co <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub> -0.4Ba(Ni <sub>1/3</sub> Nb <sub>2/3</sub> ) O <sub>3</sub> +0.5 wt% CuO	1270	Composite	32.5	82000	9	-21	1058
2388	0.09[0.5ZnNb <sub>2</sub> O <sub>6</sub> -0.5Zn <sub>3</sub> Nb <sub>2</sub> O <sub>8</sub> ]- 0.91ZnTa <sub>2</sub> O <sub>6</sub> +3 wt% ZBS	950	Composite	32.5	32400		-7	955
2389	Ba <sub>6</sub> Ti <sub>1-x</sub> Sn <sub>x</sub> Nb <sub>4</sub> O <sub>18</sub> (x=0.75)	1510	Trigonal R-3m	32.6	25800	6.2	18	982
2390	0.9MgTiO <sub>3</sub> -0.1BaTiO <sub>3</sub>	1325	Composite	32.7	31700		-85	1059
2391	ZnTiNb <sub>2</sub> O <sub>8</sub> +BaCu(B <sub>2</sub> O <sub>5</sub> )	950	Orthorhombic Pbcn	32.6	20100	5.1	-64	1060
2392	Nd[(Zn <sub>0.925</sub> Co <sub>0.075</sub> ) <sub>0.5</sub> Ti <sub>0.5</sub> ]O <sub>3</sub>	1390/4h	Not available	32.6	185300		31	1061
2393	ZnNb <sub>2</sub> O <sub>6</sub> +1.5 wt% (CuO-V <sub>2</sub> O <sub>5</sub> -Bi <sub>2</sub> O <sub>3</sub> )	870/2h	Orthorhombic columbite Pbcn	32.7	67100		-47	1062
2394	0.7TeO <sub>2</sub> -SnTe <sub>3</sub> O <sub>8</sub>	650	Mixture phases	32.7	8800		-33	62
2395	(Bi <sub>0.8</sub> La <sub>0.2</sub> ) <sub>2</sub> Mo <sub>2</sub> O <sub>9</sub>		MonoclinicP21/n	32.7	13500		-5	1063
2396	(Zr <sub>1-x</sub> Sn <sub>x</sub> )(Li <sub>1/4</sub> Nb <sub>3/4</sub> ) <sub>0.4</sub> Ti <sub>0.6</sub> O <sub>4</sub> (x=0.2)		-	32.7	47900		-4	1043
2397	0.09[0.5ZnNb <sub>2</sub> O <sub>6</sub> -0.5Zn <sub>3</sub> Nb <sub>2</sub> O <sub>8</sub> ]- 0.91ZnTa <sub>2</sub> O <sub>6</sub> +1 wt% ZBS	1050	Composite	32.7	41000		-22	955
2398	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>0.75</sub> Ti <sub>0.25</sub> ]O <sub>3-d</sub> +5 wt% LBS glass	950/4h	Perovskite Orthorhombic	32.8	11500	4.5	-3	792
2399	0.6Ba(Zn <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub> -0.7ZnNb <sub>2</sub> O <sub>6</sub>	1200/8h	Composite	32.8	34100		-10	1064
2400	Ba <sub>1-z</sub> Sr <sub>z</sub> [Zn <sub>1/3</sub> (Ta <sub>p</sub> Nb <sub>1-p</sub> ) <sub>1</sub> .Sr <sub>1-x</sub> Ca <sub>x</sub> (Ga <sub>1/2</sub> Ta <sub>1/2</sub> )]O <sub>3</sub>		Perovskite	32- 34	180000- 80000	7	0-10	1065
2401	Sr(Mg <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub> ·Mn		Perovskite Trigonal P-3m1	33.0	23700	10.3	-14	787
2402	BaTi <sub>4</sub> O <sub>9</sub> +5 wt% ZnO-B <sub>2</sub> O <sub>3</sub> glass	900/2h	Orthorhombic+Zn(BO <sub>2</sub> ) <sub>2</sub> second phase Pmmn	33.0	27000		7	1066
2403	3CaO-2CoO-Nb <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1400	Composite	33.0	15000	4.3	-18	230

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
2404	Sr(Dy <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1575/4h	Complex perovskite	33.0	32700		-63	823
2405	Ba[(Ni <sub>0.6</sub> Zn <sub>0.4</sub> ) <sub>1/3</sub> Nb <sub>2/3</sub> ]O <sub>3</sub> +1 mol% B <sub>2</sub> O <sub>3</sub>	1300	Perovskite Cubic Pm3m	33.0	39700		-4	1067
2406	Ba[Ti <sub>1-x</sub> (Zn <sub>1/2</sub> W <sub>1/2</sub> ) <sub>x</sub> ]O <sub>3</sub> (x=0.9)	1380	Cubic perovskite Fm3̄m	33.0	19900		0	695
2407	Ba <sub>0.95</sub> Sr <sub>0.05</sub> (Y <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1600	Complex perovskite	33.0	47300		0	861
2408	Ba(Y <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1625/4h	Complex perovskite cubic	33.0	50200		120	943
2409	(1-x)LaMg <sub>1/2</sub> Ti <sub>1/2</sub> O <sub>3</sub> -xLa <sub>2/3</sub> TiO <sub>3</sub> (x=0.3)		Perovskite	33.0	43000	6.3	-54	950
2410	Bi <sub>6</sub> Te <sub>2</sub> O <sub>15</sub> (oxygen atm)	800/15h	Orthorhombic	33.0	41000		-85	1068
2411	Ca[Li <sub>1/3</sub> Nb <sub>2/3</sub> ]O <sub>0.75</sub> Ti <sub>0.25</sub> O <sub>3-δ</sub> +5 wt% Li <sub>2</sub> O-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub>	950/4h	Perovskite Orthorhombic	33.0	11500		-5	792
2412	Ba(Cd <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>3</sub> +2 wt% ZnO	1550	Complex perovskite Cubic Pm3m	33.0	37500		80	1069
2413	La <sub>5</sub> AlTi <sub>3</sub> O <sub>15</sub>	1600/3h	Not available	33.0	28600		-39	954
2414	Li <sub>0.774</sub> Zr <sub>0.057</sub> NbO <sub>3</sub>	1150	Perovskite Orthorhombic	33.0	4460		-28	1070
2415	Ba <sub>1/3</sub> La <sub>2/3</sub> Zn <sub>1/3</sub> Ti <sub>2/3</sub> O <sub>3</sub>		Perovskite	33.0	19000	6.7	-11	919
2416	0.5SrTiO <sub>3</sub> -0.5LaAlO <sub>3</sub>	1550/20h	Pseudo Cubic perovskite	33.0	54000			1071
2417	Sr(Dy <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> +0.5 wt% CeO <sub>2</sub>	1575/4h	Complex Perovskite	33.0	32700		-63	823
2418	Ba(Y <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub> +0.5 wt% Nb <sub>2</sub> O <sub>5</sub>	1575	Complex perovskite	33.0	50150		120	845
2419	Ba <sub>3</sub> Sr <sub>2</sub> Ta <sub>4</sub> O <sub>15</sub> (A <sub>n</sub> B <sub>n-1</sub> O <sub>3n</sub> )	1575	Hexagonal perovskite	33.2	4300	5.2	-15	851
2420	Sr <sub>5</sub> Nb <sub>2</sub> Ta <sub>2</sub> O <sub>15</sub> (A <sub>n</sub> B <sub>n-1</sub> O <sub>3n</sub> )	1575	Hexagonal perovskite	33.2	2500	5.65	-2	851
2421	Ba <sub>3</sub> ZnNb <sub>2-x</sub> Sb <sub>x</sub> O <sub>9</sub> (x=0.375)		Perovskite	33.2	44940		-3	381
2422	(1-x)La(Mg <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> -xLa <sub>2/3</sub> TiO <sub>3</sub> (x=0.37)		Orthorhombic Imma	33.2	8560	8.3		889
2423	La <sub>5</sub> CrTi <sub>3</sub> O <sub>15</sub>	1625/2	A <sub>5</sub> B <sub>4</sub> O <sub>15</sub> type cation deficient perovskite Trigonal P3m	33.2	27500	4.88	-34	1072
2424	La <sub>4</sub> PrCrTi <sub>3</sub> O <sub>15</sub>	1575/2	A <sub>5</sub> B <sub>4</sub> O <sub>15</sub> type cation deficient Perovskite Trigonal P3m	33.2	23700	4.7	-22	1072
2425	Ba <sub>5</sub> SrTa <sub>4</sub> TiO <sub>18</sub>	1550/2h	A <sub>6</sub> B <sub>5</sub> O <sub>18</sub> type perovskite	33.2	33000		65	895
2426	Ba <sub>2</sub> Ti <sub>3</sub> Nb <sub>4</sub> O <sub>15</sub> +3 wt% ZBS	925	Tetragonal	33.2	13600		6	1073

2427	Ba[(Y <sub>0.85</sub> Pr <sub>0.15</sub> ) <sub>1/2</sub> Ta <sub>1/2</sub> ]O <sub>3</sub> +0.5 wt% Nb <sub>2</sub> O <sub>5</sub>	1575	Complex perovskite	33.2	51500		0	845
2428	Ba[(Co <sub>0.6-x/2</sub> Zn <sub>0.4-x/2</sub> Mg <sub>x</sub> ) <sub>1/3</sub> Nb <sub>2/3</sub> ]O <sub>3</sub> (x=0.3)	annealed 1400/12h	Complex perovskite	33.2	117200		14	1074
2429	Pr(Zr <sub>1/3</sub> Ti <sub>2/3</sub> )O <sub>6</sub>	1600/4h	Aeschyenite Orthorhombic Pnma	33.3	16200	4.3	14	1014
2430	(Ba <sub>0.95</sub> Sr <sub>0.05</sub> )(Co <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub>		Perovskite	33.3	87100		4	1075
2431	Ce(Zr <sub>1/3</sub> Ti <sub>1/3</sub> )O <sub>6</sub>	1600/4h	Aeschyenite Orthorhombic Pnma	33.4	15800		14	1014
2432	Zr <sub>0.8</sub> Sn <sub>0.2</sub> TiO <sub>4</sub> +4 wt% WO <sub>3</sub>	1400	Orthorhombic Pbcn	33.4	56000		0	1076
2433	Bi <sub>2</sub> O <sub>3</sub>	680	Tetragonal P-42 <sub>1</sub> c	33.5	18700	8.7	-235	30
2434	Ba(Ho <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub> +0.5 wt% Nb <sub>2</sub> O <sub>5</sub>	1575	Perovskite	33.5	24050		130	845
2435	La <sub>4</sub> NdCrTi <sub>3</sub> O <sub>15</sub>	1600/2		33.5	18000	4.7	-36	1072
2436	Ba(Ho <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1625	Complex perovskite Tetragonal	33.5	24000		130	943
2437	Sr(Gd <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> +0.2 wt% B <sub>2</sub> O <sub>3</sub>	1350/4h	Complex perovskite Tetragonal	33.5	8350		-60	823
2438	Ba <sub>8</sub> Zn(Nb <sub>6-x</sub> Sb <sub>x</sub> )O <sub>24</sub> (x=0.6)	1425	Perovskite	33.6	11500		30	503
2439	SrLi <sub>2</sub> Ti <sub>6</sub> O <sub>14</sub>	1000	Orthorhombic Cmca	33.6	8700	6.8	-3	1012
2440	Zn <sub>0.85</sub> Co <sub>0.15</sub> Ta <sub>2</sub> O <sub>6</sub>	1325/2h	Orthorhombic Pbcn	33.7	53300		42	1077
2441	BaTi <sub>4</sub> O <sub>9</sub> +10 wt% BaO-Li <sub>2</sub> O-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -ZnO glass	925	Composite	33.7	14500			1078
2442	Ba <sub>1+x</sub> [(Co <sub>0.7</sub> Zn <sub>0.3</sub> ) <sub>1/3</sub> Nb <sub>2/3</sub> ]O <sub>3</sub> (x=-0.01)	1450/10h	Perovskite Trigonal P-3m1	33.7	70900		-4	1079
2443	Ba[(Co <sub>0.6-x/2</sub> Zn <sub>0.4-x/2</sub> Mg <sub>x</sub> ) <sub>1/3</sub> Nb <sub>2/3</sub> ]O <sub>3</sub> (x=0.3)		Perovskite Trigonal P-3m1	33.7	93800		10	1080
2444	Ba <sub>2</sub> Sr <sub>3</sub> Ta <sub>4</sub> O <sub>15</sub> (A <sub>n</sub> B <sub>n-1</sub> O <sub>3n</sub> )	1600	Trigonal P-3m1 perovskite	33.7	2400	5	-25	851
2445	(Sr <sub>0.1</sub> Ba <sub>0.9</sub> )(Ti <sub>0.1</sub> Zn <sub>0.3</sub> Ta <sub>0.6</sub> )O <sub>3</sub>		—	33.7	36000	7	23	1003
2446	ZnTa <sub>2</sub> O <sub>6</sub>	1400/10h	Orthorhombic Pbcn	33.7	79310	8.5	9	1081
2447	Sr(Tb <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> +0.5 wt% CeO <sub>2</sub>	1575/4h	Complex perovskite Tetragonal	33.7	36300		-61	823
2448	Zn <sub>0.87</sub> Co <sub>0.13</sub> Ta <sub>2</sub> O <sub>6</sub>	1325/2h	Orthorhombic Pbcn	33.8	66300		43	1077
2449	93 wt% BaTi <sub>4</sub> O <sub>9</sub> +10 wt% Li <sub>2</sub> O-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub>	950	Composite	33.8	12700		25	592
2450	(Sr <sub>1-x</sub> Ba <sub>x</sub> )(Y <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> (x=0.65)	1600/4h	Complex perovskite	33.8	45600		0	823
2451	Ba <sub>4</sub> ZnTi <sub>11</sub> O <sub>27</sub> +4 wt% BaCuB <sub>2</sub> O <sub>5</sub> )	1200/2h	Monoclinic C2/m	33.8	12200	6.18	7	1082

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
2452	$\text{Sr}_6\text{Nb}_4\text{ZrO}_{18} + 2 \text{ wt\% Bi}_2\text{O}_3\text{-B}_2\text{O}_3$	1625/2h	$\text{A}_6\text{B}_5\text{O}_{18}$ type perovskite	33.9	21000		-8	895
2453	$(\text{Bi}_{0.9}\text{Nd}_{0.1})_2\text{Mo}_2\text{O}_9$		Monoclinic $\text{P2}_1/\text{n}$	33.9	15200		8	1063
2454	$\text{Ba}_{1-x}\text{La}_{2x/3}(\text{Co}_{0.7}\text{Zn}_{0.3})_{1/3}\text{Nb}_{2/3}\text{O}_3$ ( $x=0.01$ )	1425/10h	Complex perovskite	34.0	63000		5	1083
2455	$\text{Ba}_4\text{LiNb}_{3-x}\text{Ta}_x\text{O}_{12}$ ( $x=1$ )	1350	Hexagonal perovskite $\text{P6}_3\text{mc}$	34.0	56000		43	941
2456	$\text{Ba}(\text{Dy}_{1/2}\text{Ta}_{1/2})\text{O}_3 + 0.5 \text{ wt\% Nb}_2\text{O}_5$	1575	Complex perovskite	34.0	20650		-48	845
2457	$\text{Sr}_{4-m}\text{La}_m\text{Ti}_{m-1}\text{Ta}_{4-m}\text{O}_{12}$ ( $m=2$ )	1580	Not available	34.0	35000		-15	975
2458	$\text{Ba}_8\text{Li}_2\text{Nb}_2\text{Ta}_4\text{O}_{24}$		Hexagonal $\text{P6}_3\text{mmc}$	34.0	56000			952
2459	$\text{Bi}(\text{Sb}_{1-x}\text{Ta}_x)\text{O}_4$ ( $x=0.6$ )	960	Orthorhombic $\text{Pc2}_1\text{n}$	34.0	30,000		-16	581
2460	$\text{ZnTiNb}_2\text{O}_8$	1250/2h	Orthorhombic $\text{Pbcn}$	34.0	42500		-52	632
2461	$0.2\text{TiTe}_3\text{O}_8\text{-}0.8\text{TeO}_2$	670	Composite	34.0	22000		24	586
2462	$\text{BaO-TiO}_2\text{-WO}_3$ (N-35): $\text{B}_2\text{O}_3$	1200		34.0	70500	8.5	-	786, 862
2463	$\text{La}(\text{Zn}_{1/2}\text{Ti}_{1/2})\text{O}_3$	1550	Perovskite	34.0	59000	10	-52	1084, 1085
2464	$\text{Ba}_{10}\text{Ta}_{8-0.8x}\text{Ti}_x\text{O}_{30}$ ( $x=0.6$ )	1400/40h	$\text{A}_n\text{B}_{n-1}\text{O}_{3n}$ Hexagonal Perovskite $\text{P6}_3/\text{mmc}$	34.0	30820		57	920
2465	$\text{Ca}_5\text{Ta}_2\text{Ti}_{0.6}\text{Hf}_{0.4}\text{O}_{12}$	1675	Complex perovskite Orthorhombic $\text{Pnma}$	34.0	26000	4.4	0	490
2466	$\text{Ca}_5\text{Nb}_2\text{Ti}_{0.2}\text{Zr}_{0.8}\text{O}_{12}$	1670	Complex perovskite Orthorhombic $\text{Pnma}$	34.0	24000	4.4	0	662
2467	$0.25\text{Ba}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3\text{-}$ $0.75\text{Ba}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3 + \text{B}_2\text{O}_3\text{-LiF}$	1350	Perovskite Trigonal $\text{P-3m1}$	34.0	76700	7.6	-4	1086
2468	$\text{La}_5\text{Mg}_{0.5}\text{Ti}_{3.5}\text{O}_{15}$		Trigonal $\text{P-3m1}$	34.0	31000	6	-16	950, 958
2469	$\text{La}_4\text{SmCrTi}_3\text{O}_{15}$	1575/2		34.0	15900	4.89	-38	1072
2470	$0.5\text{CaTiO}_3\text{-}0.5\text{Sm}(\text{Mg}_{0.5}\text{Ti}_{0.5})\text{O}_3$	1550	Perovskite	34.0	10400	4.91	-24	865
2471	$(1-x)(\text{Mg}_{0.95}\text{Zn}_{0.05})\text{TiO}_3\text{-}x\text{Ca}_{0.6}\text{La}_{0.8/3}\text{TiO}_3$ ( $x=0.3$ )	1320/4h		34.0	61000		66	465
2472	$\text{Ca}[(\text{Li}_{1/3}\text{Nb}_{2/3})_{0.84}\text{Ti}_{0.16}]\text{O}_{3-\delta} + 2 \text{ wt\%}$ $\text{LiF} + 3 \text{ wt\% B}_2\text{O}_3$	900/2h	Perovskite	34.0	17400		-5	752
2473	$\text{Ba}(\text{Dy}_{1/2}\text{Ta}_{1/2})\text{O}_3$	1625	Complex perovskite Tetragonal	34.0	20600		-48	943

2474	Sr(Gd <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1575/4h	Perovskite	34.0	8800		-56	823
2475	0.99Ba(Co <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub> - 0.01Ba(Y <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1380	Perovskite	34.0	38690			1087
2476	0.95Ba(Yb <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> - 0.05Ca(Y <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1600	Perovskite	34.0	47500		1	763
2477	Sr(Tb <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1575/4h	Perovskite	34.0	36300		-61	823
2478	Ca <sub>5</sub> Nb <sub>2</sub> Ti <sub>0.2</sub> Zr <sub>0.8</sub> O <sub>12</sub>	1670	Perovskite Pnma Orthorhombic	34.0	24000	4.4	0	662
2479	Ca <sub>5</sub> Ta <sub>2</sub> Ti <sub>0.6</sub> Hf <sub>0.4</sub> O <sub>12</sub>	1675	Perovskite Pnma Orthorhombic	34.0	26000	4.4	0	490
2480	xBa(Zn <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub> -(1-x)Ba (Mg <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub> (x=0.25)	1500	Perovskite Hexagonal P-3m1	34.0	76700		-4	1086
2481	Ba[(Ni <sub>0.6</sub> Zn <sub>0.4</sub> ) <sub>1/3</sub> Nb <sub>2/3</sub> ]O <sub>3</sub> +0.5 mol% B <sub>2</sub> O <sub>3</sub>	1340	Perovskite Hexagonal P-3m1	34.0	42100		-8	1067
2482	LiNb <sub>3</sub> O <sub>8</sub>	1075/3h	Monoclinic P2 <sub>1</sub> /a	34.0	58000		-96	788
2483	Zr <sub>0.034</sub> Hf <sub>0.966</sub> TiO <sub>4</sub>		Orthorhombic Pbcn	34.1	34000	9.9		1088
2484	0.09[0.5ZnNb <sub>2</sub> O <sub>6</sub> -0.5Zn <sub>3</sub> Nb <sub>2</sub> O <sub>8</sub> ]- 0.91ZnTa <sub>2</sub> O <sub>6</sub> +1 wt% ZBS	1000	Composite	34.1	37100		-3	955
2485	ZnTi(Nb <sub>1-x</sub> Ta <sub>x</sub> ) <sub>2</sub> O <sub>8</sub> (x=0.05)	1140/6h	Orthorhombic Pbcn	34.1	40000		-66	1089
2486	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>0.8</sub> Ti <sub>0.2</sub> ]O <sub>3-d</sub> +15 wt% LMZBS	900	Composite	34.1	11500		-21	792
2487	Ba <sub>2</sub> SrYNb <sub>3</sub> O <sub>12</sub>	1450	Perovskite Trigonal R-3	34.1	31900		74	990
2488	Ba <sub>8</sub> Ta <sub>4</sub> Ti <sub>3</sub> O <sub>24</sub>			34.2	23050		76	920
2489	Ba <sub>5</sub> Nb <sub>2</sub> Ta <sub>2</sub> O <sub>15</sub>	1475	Perovskite	34.2	10500		22	1090
2490	0.7BaTi <sub>4</sub> O <sub>9</sub> -0.3BaZn <sub>2</sub> Ti <sub>4</sub> O <sub>11</sub>	1240/3h	Composite	34.2	60600		-2	1091
2491	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>0.8</sub> Ti <sub>0.2</sub> ]O <sub>3-d</sub> +1 wt% LBS	1100	Perovskite Orthorhombic	34.2	22900		-10	792
2492	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>0.8</sub> Ti <sub>0.2</sub> ]O <sub>3-d</sub> +3 wt% LMZBS	1025	Complex Perovskite Orthorhombic	34.2	24500		-5	792
2493	Ba(Sm <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1500	Perovskite	34.3	27000	7.7	5	590
2494	Ba[Ni <sub>0.6</sub> Zn <sub>0.4</sub> ]O <sub>3.33</sub> Nb <sub>0.67</sub> ]O <sub>3</sub> +0.5 mol% B <sub>2</sub> O <sub>3</sub>	1350	Perovskite Hexagonal P-3m1	34.3	42100		-3	1067
2495	0.5ZnNb <sub>2</sub> O <sub>6</sub> -0.5TiO <sub>2</sub>	1250/2h	Composite	34.3	42500		-52	1092
2496	ZnTiNb <sub>2</sub> O <sub>8</sub>	1250	Orthorhombic Pbcn	34.3	42500		-52	1093

(continued)



No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
2497	$\text{Zn}_{0.89}\text{Co}_{0.11}\text{Ta}_2\text{O}_6$	1325/2h	Tri rutile Tetragonal	34.3	72000		44	1077
2498	$\text{Ca}[(\text{Li}_{1/3}\text{Nb}_{2/3})_{0.84}\text{Ti}_{0.16}]\text{O}_{3-\delta}+2 \text{ wt}\%$ $\text{LiF}+3 \text{ wt}\% \text{ ZnO-B}_2\text{O}_3\text{-SiO}_2$	900/2h	Complex Perovskite Orthorhombic	34.3	17400		-5	1094
2499	$\text{Ba}_3\text{Sr}_2\text{Ta}_4\text{O}_{15}$	1575		34.3	4000		-15	1090
2500	$\text{Sr}(\text{Gd}_{1/2}\text{Nb}_{1/2})\text{O}_3+0.5 \text{ wt}\% \text{ CeO}_2$	1575/4h	Complex perovskite Tetragonal	34.3	8800		-56	823
2501	$\text{Sr}(\text{Eu}_{1/2}\text{Nb}_{1/2})\text{O}_3+0.2 \text{ wt}\% \text{ B}_2\text{O}_3$	1350/4h	Complex perovskite Tetragonal	34.3	37600		-54	823
2502	$\text{Ca}(\text{Zn}_{0.333}\text{Nb}_{0.662}\text{V}_{0.005})\text{O}_3$	1200/3h		34.3	16400		-17	1095
2503	$0.5\text{La}_{2/3}\text{TiO}_3\text{-}0.5\text{LaAlO}_3$	1425	Perovskite Orthorhombic	34.4	45000	6.7	-23	1096
2504	$(\text{NaBi})_{1/2}\text{MoO}_4$	690	Tetragonal $\text{I}4_1/\text{a}$	34.4	12300	7.5	43	677
2505	$(\text{Zr}_{1-x}\text{Sn}_x)(\text{Li}_{1/4}\text{Nb}_{3/4})_{0.4}\text{Ti}_{0.06}\text{O}_4$ ( $x=0.5$ )			34.4	44500		-14	1043
2506	$\text{Bi}_2\text{Te}_2\text{W}_3\text{O}_{16}$		Monoclinic $\text{C}2/\text{c}$	34.5	3200		-92	886
2507	$\text{Ba}_3\text{Co}_{0.7}\text{Zn}_{0.3}\text{Nb}_2\text{O}_9+0.4 \text{ wt}\% \text{ CeO}_2$	1450/4h	Perovskite Trigonal $\text{P-}3\text{m}1$	34.5	84000	4	0	1097
2508	$0.7\text{Ba}(\text{Co}_{1/3}\text{Nb}_{2/3})\text{O}_3\text{-}$ $0.3\text{Ba}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3$	1400/20h	Complex perovskite Trigonal $\text{P-}3\text{m}1$	34.5	97000	6.5	0	1097, 1098
2509	$0.5\text{LaAlO}_3\text{-}0.5\text{SrTiO}_3+0.25 \text{ wt}\% \text{ B}_2\text{O}_3$	1430/2h	Perovskite Psuedocubic	34.5	43200	7	-11	1099
2510	$\text{Ba}_3\text{Co}_7\text{Zn}_3\text{Nb}_2\text{O}_9+\text{V}_2\text{O}_5$	1450	Perovskite Trigonal $\text{P-}3\text{m}1$	34.5	85000	4	0	1097
2511	$\text{La}_4\text{SmCrTi}_3\text{O}_{15}$	1650	Hexagonal $\text{P}3\text{m}$	34.5	17300	4.7	-38	1072
2512	$\text{MgO-}0.4\text{Nb}_2\text{O}_5\text{-}1.5\text{TiO}_2$		Composite	34.5	81300		-2	976
2513	$\text{Ba}_4\text{LiNb}_3\text{O}_{12}+4 \text{ wt}\% \text{ BCB}$	950	Hexagonal $\text{P}6_3\text{mc}$	34.5	29600		12	1100
2514	$0.5\text{CeO}_2\text{-}0.5\text{BaTi}_4\text{O}_9$	1260/4h	Cubic flurite $\text{Fm}3\text{m}+$ Orthorhombic $\text{Pnmm}$	34.5	20050	4.2	2	646
2515	$\text{NdTiSb}_x\text{Ta}_{1-x}\text{O}_6$ ( $x=0.2$ )	1480		34.6	14500	4.2	41	1101
2516	$\text{ZnTa}_2\text{O}_6+0.5 \text{ wt}\% \text{ CuO}$	1230	Orthorhombic $\text{Pbcn}$	34.6	65500		5	1102
2517	$\text{DyTiTaO}_6$	1500	Aeschneite Orthorhombic	34.6	40100		7	583
2518	$\text{BaTi}_4\text{O}_9+3 \text{ wt}\% \text{ MCAS glass}$	1200	Orthorhombic $\text{Pnmm}$	34.6	42050	7	14	1103
2519	$\text{La}_4\text{PrCrTi}_3\text{O}_{15}$	1575	Trigonal $\text{P}3\text{m}$	34.6	23700	4.8	-22	1072
2520	$0.09(0.5\text{ZnNb}_2\text{O}_6\text{-}0.5\text{Zn}_3\text{Nb}_2\text{O}_8)\text{-}$ $0.91\text{ZnTa}_2\text{O}_6$	1350	Orthorhombic mixtures	34.7	41950		0	542
2521	$\text{Bi}[\text{Sb}_{1-x}(\text{Nb}_{0.992}\text{V}_{0.008})_x]\text{O}_4$ ( $x=0.4$ )		Monoclinic $\text{I}2/\text{c}$	34.7	16000		16	715
2522	$\text{Sr}(\text{Eu}_{1/2}\text{Nb}_{1/2})\text{O}_3+0.5 \text{ wt}\% \text{ CeO}_2$	1575/4h	Complex perovskite Tetragonal	34.7	44000		-52	823

2523	BaSr <sub>2</sub> YNb <sub>3</sub> O <sub>12</sub>	1450	Perovskite Trigonal R-3	34.7	26200		-8	990
2524	La <sub>5</sub> CrTi <sub>3</sub> O <sub>15</sub>	1650	Trigonal P3m	34.8	34000	4.8	-35	1072
2525	Sr <sub>6</sub> Ta <sub>4</sub> TiO <sub>18</sub> +3 wt% Bi <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub> glass	1625/2h		34.8	5600		-19	895
2526	BiNbO <sub>4</sub> +0.03 wt% CuV <sub>2</sub> O <sub>6</sub>	1050	Monoclinic P-1	34.9	9870		-3	1104
2527	Ba <sub>5</sub> SrTa <sub>4</sub> TiO <sub>18</sub>	1550/4h		34.9	33000		65	895
2528	Sr <sub>3</sub> YNb <sub>3</sub> O <sub>12</sub>	1450		34.9	15300		46	990
2529	0.09[0.5ZnNb <sub>2</sub> O <sub>6</sub> -0.5Zn <sub>3</sub> Nb <sub>2</sub> O <sub>8</sub> ]- 0.91ZnTa <sub>2</sub> O <sub>6</sub> +0.5 wt% ZBS	1250	Composite	34.9	53900		-2	955
2530	Bi <sub>2</sub> O <sub>3</sub> -2.2MoO <sub>3</sub>	620	Mixture	35.0	12000		-13	494
2531	Ca[(Li <sub>1/3</sub> Ta <sub>2/3</sub> ) <sub>0.7</sub> Ti <sub>0.3</sub> ]O <sub>3-d</sub> +3 wt% B <sub>2</sub> O <sub>3</sub>	1050	Perovskite Orthorhombic	35.0	22800	9.45	-4	765
2532	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>0.9</sub> Ti <sub>0.1</sub> ]O <sub>3-d</sub> +0.7 wt% B <sub>2</sub> O <sub>3</sub>	1000	Perovskite Orthorhombic	35.0	22100		-5	765
2533	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>1-x</sub> Ti <sub>x</sub> ]O <sub>3-d</sub> (x=0.1)	1150/3h	Perovskite Orthorhombic	35.0	27200		-2	752
2534	0.5TeO <sub>2</sub> -0.5SnTe <sub>3</sub> O <sub>8</sub>	650	Mixture phases	35.0	8500		176	62
2535	BaTi <sub>4</sub> O <sub>9</sub> -0.1WO <sub>3</sub>	1400	Orthorhombic Pmmn	35.0	52000	8	-1	171
2536	0.46LaAlO <sub>3</sub> -0.54SrTiO <sub>3</sub> +2 wt% B <sub>2</sub> O <sub>3</sub>	1460/2h	Perovskite Psuedo cubic	35.0	38000	7	-1	1105
2537	0.5LaAlO <sub>3</sub> -0.5SrTiO <sub>3</sub>		Psudocubic perovskite	35.0	27000		-18	1106
2538	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>0.8</sub> Ti <sub>0.2</sub> ]O <sub>3-d</sub> +5 wt% Bi <sub>2</sub> O <sub>3</sub>	900/3h	Perovskite Orthorhombic	35.0	11000		13	610
2539	BaZrO <sub>3</sub>		Perovskite Cubic P23	35.0	8800			906
2540	Ba <sub>10</sub> Ta <sub>8-0.8x</sub> Ti <sub>x</sub> O <sub>30</sub> (x=1.2)	1400/40h	Hexagonal perovskite	35.0	25760		64	920
2541	Ca(Zn <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub>		Perovskite	35.0	16,000	-	-43	609
2542	0.42Zn <sub>3</sub> Nb <sub>2</sub> O <sub>8</sub> -0.58TiO <sub>2</sub>	1250	Composite	35.0	48000		0	1092
2543	Pb <sub>0.75</sub> Ca <sub>0.25</sub> (Al <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>		Perovskite	35.0	1100	4.7	133	996
2544	Ca <sub>4.75</sub> Ni <sub>0.25</sub> Ta <sub>2</sub> TiO <sub>12</sub>	1625	Perovskite Orthorhombic Pnma	35.0	34000	4.5	±0.5	230
2545	0.5CeO <sub>2</sub> -0.25CaO-0.25TiO <sub>2</sub> :6.5Cr <sub>2</sub> O <sub>3</sub>	1550	Composite	35.0	4300	4.4	0	488
2546	Sr(Cr <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1600/4h	Perovskite Cubic Pm3m	35.0	6400		-80	823
2547	Sr(Eu <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1575/4h	Perovskite Monoclinic P2 <sub>1</sub> /n	35.0	44000		-52	823
2548	0.9Ba(Zn <sub>0.6</sub> Co <sub>0.4</sub> ) <sub>0.33</sub> Nb <sub>0.67</sub> ]O <sub>3</sub> - 0.1Ba(Ga <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>		Perovskite	35.0	93550	3.06	0	1107
2549	BaO-4TiO <sub>2</sub> -0.1WO <sub>3</sub>		Composite	35.0	52400	6	0	171

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
2550	Ba[(Zn <sub>0.3</sub> Co <sub>0.7</sub> ) <sub>1/3</sub> Nb <sub>2/3</sub> O <sub>3</sub> +0.25 wt% V <sub>2</sub> O <sub>5</sub>	1450/4h	Perovskite Trigonal P-3m1	35.0	85000		0	1108
2551	Ba[(Co <sub>0.7</sub> Zn <sub>0.3</sub> ) <sub>1/3</sub> Nb <sub>2/3</sub> ]O <sub>3</sub> +0.4 wt% CeO <sub>2</sub>	1450	Perovskite Trigonal P-3m1	35.0	84000		0	1097
2552	0.9Ba[(Zn <sub>0.6</sub> Co <sub>0.4</sub> ) <sub>1/3</sub> Nb <sub>2/3</sub> ]O <sub>3</sub> -0.1Ba(Ga <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>		Perovskite	35.0	97600		0	1109
2553	0.35Ba(Ni <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub> -0.65Ba(Zn <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub>	1450/4h	Perovskite Trigonal P-3m1	35.0	25000		1	1110
2554	BaO-Al <sub>2</sub> O <sub>3</sub> -4TiO <sub>2</sub>		—	35.0	5000	—	-15	1111
2555	Ca <sub>4.75</sub> Ni <sub>0.25</sub> Ta <sub>2</sub> TiO <sub>12</sub>	1625	Complex perovskite	35.0	34000	4.49	0	230, 1112
2556	BaO-4TiO <sub>2</sub> -0.1WO <sub>3</sub>	1400/2h in O <sub>2</sub>	Composite	35.0	50400		-0.5	171
2557	0.5LaAlO <sub>3</sub> -0.5SrTiO <sub>3</sub> +0.25 wt% B <sub>2</sub> O <sub>3</sub>	1430	Pseudo Cubic perovskite	35.0	43200		-11	1099
2558	0.46LaAlO <sub>3</sub> -0.54SrTiO <sub>3</sub> +0.25 wt% B <sub>2</sub> O <sub>3</sub>	1460/2h	Pseudo Cubic perovskite	35.0	38000		-1	1113
2559	La <sub>5</sub> GaTi <sub>3</sub> O <sub>15</sub>	1550	A <sub>5</sub> B <sub>4</sub> O <sub>15</sub> type cation deficient Perovskite	35.0	30300	3.09	-55	954
2560	ZnTa <sub>2</sub> O <sub>6</sub>	1200	Orthorhombic Pbcn	35.1	50600		10	1114
2561	Zn <sub>0.9</sub> Ti <sub>0.8-x</sub> Sn <sub>x</sub> Nb <sub>2.2</sub> O <sub>8</sub> (x=0.05)	1120/6h	Orthorhombic Pbcn	35.1	49100		-28	1115
2562	(1-x)La(Mg <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> -xLa <sub>2/3</sub> TiO <sub>3</sub> (x=0.4)		Perovskite 12/a	35.1	6700	7.9		889
2563	Sr(Cr <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> +0.2 wt% B <sub>2</sub> O <sub>3</sub>	1350/4h	Complex perovskite Cubic Pm3m	35.1	12500		-73	823
2564	0.17Ba <sub>5</sub> Nb <sub>4</sub> O <sub>15</sub> -0.83BaNb <sub>2</sub> O <sub>6</sub> (hex)	1250/2h	Hexagonal perovskite	35.2	59300		0	1116
2565	BaTi <sub>4.35</sub> Zn <sub>0.55</sub> O <sub>10.25</sub>	1260/6h		35.2	5000		36	1117
2566	Ba <sub>2</sub> Sr <sub>3</sub> Ta <sub>4</sub> O <sub>15</sub>	1575	Hexagonal perovskite	35.2	2400		-25	1090
2567	0.05Ca(Y <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> -0.95Ba(Y <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1550/4h	Complex perovskite	35.2	48300		1	763
2568	PrTiSb <sub>x</sub> Ta <sub>1-x</sub> O <sub>6</sub> (x=0.2)	1480		35.2	12700	4.2	48	1101
2569	Ca <sub>4</sub> La <sub>2</sub> Ti <sub>5-x</sub> (Mg <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>x</sub> O <sub>17</sub> (x=4)	1540	Orthorhombic Pbnm	35.2	21300		-17	1118

2570	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>0.8</sub> Ti <sub>0.2</sub> ]O <sub>3-d</sub> +0.1 wt% LMZBS	1050	Complex perovskite Orthorhombic	35.2	22800		-4	792
2571	Sr(Cr <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1600/4h	Complex perovskite	35.3	6400		-80	823
2572	0.6Ba(Zn <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub> -0.4Ba(Co <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub>	1450	Perovskite	35.5	86000	2	0	1119
2573	Sr(Sm <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> +0.2 wt% B <sub>2</sub> O <sub>3</sub>	1350/4h	Complex perovskite Tetragonal	35.5	34500		-48	823
2574	Ba(Tb <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1625	Complex perovskite Tetragonal	35.5	31900		-38	943
2575	Ba(Tb <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub> +0.5 wt% Nb <sub>2</sub> O <sub>5</sub>	1575	Complex perovskite Tetragonal	35.5	31900		-38	845
2576	(Zr <sub>1-x</sub> Sn <sub>x</sub> )(Li <sub>1/4</sub> Nb <sub>3/4</sub> ) <sub>0.4</sub> Ti <sub>0.6</sub> O <sub>4</sub> (x=0.1)			35.5	37800		-5	1043
2577	0.8ZnTa <sub>2</sub> O <sub>6</sub> -0.2MgNb <sub>2</sub> O <sub>6</sub>	1350/2h	Composite	35.6	65500		0	1120
2578	La <sub>4</sub> NdCrTi <sub>3</sub> O <sub>15</sub>	1650	Trigonal P3m	35.6	19400	4.7	-34	1072
2579	Dy(W <sub>0.5</sub> Ti <sub>1.5</sub> )O <sub>6</sub>	1450	Orthorhombic Pnma Aeschynite type	35.6	20200		10	1121
2580	Ba(Sc <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1700/12h	Perovskite	35.7	20000			1122
2581	Ba <sub>3</sub> ZnNb <sub>2-x</sub> Sb <sub>x</sub> O <sub>9</sub> (x=0.125)		Perovskite Hexagonal P-3m1	35.7	56980	4.8	14	381
2582	SmTaTi <sub>0.9</sub> Zr <sub>0.1</sub> O <sub>6</sub>			35.8	27730		15	671
2583	Ba <sub>3</sub> ZnNb <sub>2-x</sub> Sb <sub>x</sub> O <sub>9</sub> (x=0.25)		Perovskite Trigonal P-3m1	35.8	35090	5.4	6	381
2584	0.615BaTi <sub>4</sub> O <sub>9</sub> -0.35ZnO-0.3Nb <sub>2</sub> O <sub>5</sub> +0.3 wt% Mn	1280/2h	Composite	35.8	50800		1	1123
2585	Bi(Nb <sub>0.7</sub> Ta <sub>0.3</sub> )O <sub>4</sub>	900	Orthorhombic Pnma	35.8	2200		-48	1124
2586	Sr(Sm <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> +0.5 wt% CeO <sub>2</sub>	1575/4h	Complex perovskite Tetragonal	35.8	32300		-47	823
2587	Ba <sub>3-x</sub> Sr <sub>x</sub> LaNb <sub>3</sub> O <sub>12</sub> (x=3)	1430	Trigonal R-3m	35.8	44300		-9	1125
2588	BaO-0.6ZnO-3TiO <sub>2</sub>	1180	Composite	35.8	21300		1	1126
2589	Zn <sub>0.7</sub> Co <sub>0.3</sub> TiNb <sub>2</sub> O <sub>8</sub>	1075/4h	Orthorhombic Pbcn	35.9	35100		0	1127
2590	Ba <sub>8</sub> Zn(Nb <sub>6-x</sub> Sb <sub>x</sub> )O <sub>24</sub> (x=1.5)	1425		35.9	16900		9	503
2591	0.5LaAlO <sub>3</sub> -0.5SrTiO <sub>3</sub>	1680	Perovskite	35.9	108800	9.7	-21	832
2592	(Zr <sub>0.8</sub> Sn <sub>0.2</sub> )TiO <sub>4</sub> +0.2 wt% NiO	1280	Orthorhombic Pbcn	35.9	56700	9.2		1128
2593	Ba <sub>6</sub> Nb <sub>4</sub> ZrO <sub>18</sub>	1625/2h	Trigonal R-3m	35.9	52000		25	895
2594	(Ag <sub>0.5</sub> Bi <sub>0.5</sub> )MoO <sub>4</sub>	580	Wolframite Monoclinic C12/m1	35.9	13000	7.5	-69	1129
2595	BaO-TiO <sub>2</sub> -WO <sub>3</sub> (N-35)		Composite	36.0	50400	6	0	862

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
2596	Ba <sub>1-x</sub> Ca <sub>x</sub> (Sc <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>		Perovskite	36- 55	20000- 55000			1122
2597	Sr(La <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> +0.2 wt% B <sub>2</sub> O <sub>3</sub>	1350/4h	Complex perovskite Tetragonal	36.0	5200		-22	823
2598	Ba(Nd <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1500	Complex perovskite	36.0	18000	7.3	2.9	590
2599	Sr(Sm <sub>0.5</sub> Ta <sub>0.5</sub> )O <sub>3</sub> +0.5 wt% Nb <sub>2</sub> O <sub>5</sub> +wt% TiO <sub>2</sub>	1600/4h	Complex perovskite Tetragonal	36.0	22300		-38	859
2600	Ba <sub>2</sub> Ti <sub>9</sub> O <sub>20</sub> +9 wt% BaB <sub>2</sub> O <sub>4</sub>	1050/2h	Monoclinic P2 <sub>1</sub> /m	36.0	12600		-2	1002
2601	Ba(Zn <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub> +5 mol% B <sub>2</sub> O <sub>3</sub> +CuO	875	Perovskite	36.0	19000		21	1130
2602	Bi <sub>2</sub> TiTeO <sub>8</sub>	840/10h		36.0	4700	5.7	41	1131
2603	BaTi <sub>4</sub> O <sub>9</sub> -Citrate route	1250/10h	Orthorhombic Pnmm	36.0	50470		16	1132
2604	Ba <sub>10</sub> Ta <sub>7.04</sub> Ti <sub>1.2</sub> O <sub>30</sub>		Hexagonal P6 <sub>3</sub> /mmc	36.0	30000		52	464
2605	BaTi <sub>4</sub> O <sub>9</sub> -ZnO-Ta <sub>2</sub> O <sub>5</sub> +0.1 wt% Mn	1280	Orthorhombic Pnmm	36.0	45000	4.5	0	1133
2606	Nd(Zn <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub>		Perovskite	36.0	42300		-47	1134
2607	TiTe <sub>3</sub> O <sub>8</sub>	700/5h	Cubic Ia3	36.0	13600	4	133	53
2608	0.25Zn <sub>3</sub> Nb <sub>2</sub> O <sub>8</sub> -0.75TiO <sub>2</sub>	1200/2h	Composite	36.0	5160		4	632
2609	BaO-TiO <sub>2</sub> -WO <sub>3</sub> (N-35)+5 wt% SiO <sub>2</sub>	1200	Composite	36.0	4500	8.5		786
2610	ZrTiO <sub>4</sub> (polymer route)+0.5 wt% Hf	1600	Orthorhombic Pbcn	36.0	29700	5.3		1135
2611	Ba(Yb <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1600	Complex perovskite	36.0	38100		2	1136
2612	Nd <sub>2</sub> Ti <sub>2</sub> O <sub>7</sub>	1300	Monoclinic P2 <sub>1</sub>	36.0	16400		-118	1137, 1138
2613	Ba(Gd <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1625/4h	Complex perovskite Tetragonal	36.0	3200		-18	943
2614	Ba(Tb <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1625/4h	Complex perovskite Tetragonal	36.0	31900		-38	943
2615	(Pb <sub>0.2</sub> Ca <sub>0.8</sub> )(Ca <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub>	1350	Perovskite	36.0	12500		-27	1139
2616	0.6Ba(Zn <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub> - 0.4Ba(Co <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub>	1400	Perovskite Trigonal P-3m1	36.0	86000		0	1119
2617	Sr(Sm <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1575/4h	Complex perovskite	36.0	32300		-47	823
2618	Ca <sub>4</sub> NiNb <sub>2</sub> TiO <sub>12</sub>	1550	Perovskite Orthorhombic	36.0	31500	4.1	-30	230
2619	Ca <sub>4.88</sub> Co <sub>0.12</sub> Ta <sub>2</sub> TiO <sub>12</sub>	1625	Orthorhombic Pnma Perovskite	36.0	35000	4.49	0	230, 1112
2620	Ca <sub>5</sub> Ta <sub>2</sub> Ti <sub>0.7</sub> Zr <sub>0.3</sub> O <sub>12</sub>	1650	Perovskite Pnma Orthorhombic	36.0	28000	4.4	0	662

2621	$\text{La}_4\text{MgTi}_3\text{O}_{12}$		Perovskite slab series	36.0	26000	5.8	-39	950
2622	$0.2\text{CaTiO}_3\text{-}0.8\text{Ca}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$	1450	Composite	36.0	39000	7.7	-30	944
2623	$\text{Li}_2\text{O-Nb}_2\text{O}_5\text{-TiO}_2\text{+}1\text{ wt}\% \text{ B}_2\text{O}_3$	1100		36.0	10450	5.9	12	1140
2624	$5\text{Li}_2\text{O-Nb}_2\text{O}_5\text{-}5\text{TiO}_2$	1120		36.0	10500		12	760
2625	$\text{Ba}_2\text{Ti}_{9-x}[\text{La}_{0.5}\text{Ta}_{.5}]_x\text{O}_{20}$ ( $x=0.05$ )	1350	Monoclinic P-1	36.0	60000		12	1141
2626	$\text{Ba}_8\text{Ta}_{4+0.8x}\text{Ti}_{3-x}\text{O}_{24}$ ( $x=0=0.4$ )	1400/40h	$\text{A}_n\text{B}_{n-1}\text{O}_{3n}$ Hexagonal Perovskite	36.0	12000		-	1142
2627	$\text{Ba}_{7/12}\text{La}_{5/12}\text{Zn}_{1/3}\text{Ti}_{5/12}\text{Nb}_{3/12}\text{O}_3$	1400		36.0	1100	5.01	-14	919
2628	$\text{Sr}_3\text{LaNb}_3\text{O}_{12}$	1430	Hexagonal perovskite	36.0	45000		-9	1143
2629	$\text{Ba}(\text{Gd}_{1/2}\text{Ta}_{1/2})\text{O}_3\text{+}0.5\text{ wt}\% \text{ Nb}_2\text{O}_5$	1575	Complex perovskite Tetragonal	36.0	3150		-18	845
2630	$\text{Ba}[(\text{Zn}_{0.6}\text{Mg}_{0.4})\text{Nb}_{2/3}]\text{O}_3$		Perovskite Hexagonal P-3m1	36.0	94400		29	1144
2631	$\text{TiO}_2\text{+}50\text{ vol}\% \text{ ZBS glass}$	900	Composite	36.0	7500			1145
2632	$\text{Ba}(\text{Ti}_{0.5}\text{Mn}_{0.5})\text{O}_3\text{+}5\text{ wt}\% \text{ Bi}_2\text{O}_3$	1200	Perovskite	36.0	6800		25	956
2633	$0.6\text{La}_{1/2}\text{Mg}_{1/2}\text{TiO}_3\text{-}0.4\text{La}_{1/2}\text{Na}_{1/2}\text{TiO}_3\text{+}1\text{ wt}\% \text{ B}_2\text{O}_3$	1475	Composite	36.0	15500	8	-5	1146
2634	$\text{Ba}_8(\text{Mg}_{1-x}\text{Zn}_x)\text{Nb}_6\text{O}_{24}$ ( $x=0.2$ )			36.0	16950		57	1147
2635	$\text{NdTiSb}_x\text{Ta}_{1-x}\text{O}_6$ ( $x=0.1$ )	1480/4h		36.0	17600	4.19	48	1101
2636	$\text{Ba}_4\text{MgTi}_{11}\text{O}_{27}$	1275	Monoclinic C2/m	36.1	19600		15	1148
2637	$\text{Ba}_8\text{Zn}(\text{Nb}_{6-x}\text{Sb}_x)\text{O}_{24}$ ( $x=0$ )	1425		36.2	10900		50	503
2638	$\text{Ba}_3\text{LiNb}_{0.5}\text{Sb}_{2.5}\text{Ti}_5\text{O}_{21}$	1200	Hexagonal P6 <sub>3</sub> /mcm	36.2	27000		20	923
2639	$\text{Ba}_8(\text{Mg}_{1-x}\text{Zn}_x)\text{Nb}_6\text{O}_{24}$ ( $x=1$ )			36.2	10900		50	1147
2640	$\text{Sr}_5\text{NbTa}_3\text{O}_{15}$	1575	Hexagonal perovskite P-3m1	36.2	6900	5.14	31	851
2641	$\text{La}_5\text{GaTi}_3\text{O}_{15}$	1600/30h	$\text{A}_5\text{B}_4\text{O}_{15}$ type cation deficient Perovskite	36.2	30300		-55	954
2642	$\text{BaTi}_4\text{O}_9\text{+}5\text{ mol}\% \text{ CuO+}2\text{ mol}\% \text{ B}_2\text{O}_3$	900/2h	Orthorhombic Pmmn	36.3	30500		28	1149
2643	$\text{La}_6\text{MgTi}_4\text{O}_{18}$	1625/2h	$\text{A}_6\text{B}_5\text{O}_{18}$ type perovskite	36.3	27350		-39	895
2644	$\text{ZnTiNbTaO}_8$	1140/6h	Orthorhombic Pbcn	36.3	67000		58	1150
2645	$\text{CeTiSb}_x\text{Ta}_{1-x}\text{O}_6$ ( $x=0.05$ )	1480/4h		36.3	11500	3.99	63	1101
2646	$(\text{Sr}_{1-x}\text{Ba}_x)(\text{Y}_{1/2}\text{Nb}_{1/2})\text{O}_3$ ( $x=0.95$ )	1600/4h	Complex perovskite	36.3	48600		0	823
2647	$0.85\text{BaTi}_4\text{O}_9\text{-}0.15\text{BaZn}_2\text{Ti}_4\text{O}_{11}\text{+}1\text{ wt}\% \text{ CuO}$	1150/3h	Composie	36.4	62600		0	1151
2648	$\text{CaTi}_{0.3}(\text{Al}_{1/2}\text{Nb}_{1/2})_{0.7}\text{O}_3\text{+}1\text{ wt}\% \text{ Li}_3\text{NbO}_4$	1300/5h	Perovskite Orthorhombic	36.4	38900	7	-57	1152

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No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
2649	Sr <sub>6</sub> Nb <sub>4</sub> ZrO <sub>18</sub> +2 wt% Bi <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub> glass	1625/2h		36.4	21000		-8	895
2650	5Li <sub>2</sub> O-1Nb <sub>2</sub> O <sub>5</sub> -5TiO <sub>2</sub> +1 wt% B <sub>2</sub> O <sub>3</sub> +4 wt% ZnO	920	Multiphase	36.4	8800		4	1153
2651	Nd <sub>2</sub> Ti <sub>2</sub> O <sub>7</sub>		Monoclinic P2 <sub>1</sub> /n	36.5	16400	9.1	-118	1137
2652	Bi <sub>2</sub> Mo <sub>2</sub> O <sub>9</sub> +2 mol% Nb <sub>2</sub> O <sub>5</sub>	620	Monoclinic P2 <sub>1</sub> /n	36.5	14100		6	1154
2653	Ba(Eu <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub> +0.5 wt% Nb <sub>2</sub> O <sub>5</sub>	1575	Perovskite Tetragonal	36.5	41200		-16	845
2654	Ba <sub>2</sub> Ti <sub>9</sub> O <sub>20</sub> +5 wt% B <sub>2</sub> O <sub>3</sub>	1200	Monoclinic P2 <sub>1</sub> /n	36.5	40200		38	1149
2655	BaO-TiO <sub>2</sub> -ZnO+0.5 mol% MnCO <sub>3</sub> +0.24 mol% SnO <sub>2</sub>	1160/6h	Mixture phases	36.5	42000	4.7	2	1117
2656	La <sub>5</sub> Zn <sub>0.5</sub> Ti <sub>3.5</sub> O <sub>15</sub>	1500		36.5	23000	5.3	-39	954
2657	BaTi <sub>4.35</sub> Zn <sub>0.55</sub> O <sub>10.25</sub> +0.5 mol% SnO <sub>2</sub>	1160/6h		36.5	42000		2	1117
2658	0.3TeO <sub>2</sub> -0.7SnTe <sub>3</sub> O <sub>8</sub>	660/2h	Mixture phases	36.5	8800		200	62
2659	Sr(Nd <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> +0.2 wt% B <sub>2</sub> O <sub>3</sub>	1350/4h	Complex perovskite Cubic	36.5	22200		-42	823
2660	Ca <sub>5</sub> Ta <sub>2</sub> TiO <sub>12</sub> +1 wt% Co <sub>3</sub> O <sub>4</sub>	1625/4h	Complex perovskite Orthorhombic Pnma	36.5	38500		6	1155
2661	0.7SrTiO <sub>3</sub> -0.3LaAlO <sub>3</sub> +10 wt% ZnO-B <sub>2</sub> O <sub>3</sub>	1100/3h		36.6	10800		-4	1156
2662	Ba <sub>3</sub> Ti <sub>5</sub> Nb <sub>6</sub> O <sub>28</sub> +3 wt% ZnB <sub>2</sub> O <sub>4</sub>	925	Monoclinic P2 <sub>1</sub> /c	36.6	19100		5	1157
2663	Sr(La <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> +0.5 wt% CeO <sub>2</sub>	1575/4h	Complex perovskite Cubic	36.6	4025		-20	823
2664	0.6ZrO <sub>2</sub> -0.4(Zn <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>2</sub> -0.2SnO <sub>2</sub> -0.8TiO <sub>2</sub>	1220	Tetragonal	36.6	43200		-6	1158
2665	(5-x)BaO-xMgO-2Nb <sub>2</sub> O <sub>5</sub> (x=0.5)	1200	Mixed phases	36.7	20000		61	1159
2666	(Zr <sub>0.8</sub> Sn <sub>0.2</sub> )TiO <sub>4</sub> +0.2 wt% MgO	1320	Orthorhombic Pbcn	36.7	60000	6.5		1160
2667	Sr(Pr <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> +0.2 wt% B <sub>2</sub> O <sub>3</sub>	1350/4h	Complex perovskite Cubic	36.7	4600		-35	823
2668	Ba <sub>6</sub> Ti <sub>1-x</sub> Sn <sub>x</sub> Nb <sub>4</sub> O <sub>18</sub> (x=0.5)	1500	Monoclinic P2 <sub>1</sub> /c	36.7	21400	5.7	34	982
2669	ZnTiNb <sub>2</sub> O <sub>8</sub>	1075/5h	Orthorhombic Ixiolite Pbcn	36.7	54000		-70	1161
2670	Ba <sub>4</sub> ZnTi <sub>11</sub> O <sub>27</sub>	1200/2h	Monoclinic C2/m	36.8	16460		17	1082
2671	Ba <sub>3</sub> LaTa <sub>3</sub> O <sub>12</sub>		A <sub>4</sub> B <sub>4</sub> O <sub>12</sub> Cation deficient perovskite	36.8	22000	6.4	-50	1162
2672	NdTiSb <sub>x</sub> Ta <sub>1-x</sub> O <sub>6</sub> (x=0.05)	1480/4h		36.8	15700	4.13	48	1101

2673	$\text{CaTi}_{0.3}(\text{Al}_{1/2}\text{Nb}_{1/2})_{0.7}\text{O}_3$	1500/5h	Perovskite	36.8	29800	7	-61	1152
2674	$\text{Ca}(\text{Fe}_{1/2}\text{Nb}_{1/2})\text{O}_3$		Perovskite Orthorhombic Pbnm	36.8	15800	8.2	-93	1163, 1164
2675	$\text{TbTiTaO}_6$	1525	Orthorhombic	36.8	32300		10	583
2676	$\text{BaO-ZnO-TiO}_2+0.5 \text{ mol\% MnCO}_3$	1250		36.8	39000		-7	1117
2677	$\text{Ba}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3+1 \text{ mol SnO}_2$ annealed at 1325	1450/4h	Perovskite Trigonal P-3m1	36.8	83200		29	1165
2678	$\text{CeTiSb}_x\text{Ta}_{1-x}\text{O}_6$ (x=0.1)	1480/4h		36.9	10100	3.98	67	1101
2679	$\text{Sr}(\text{Nd}_{1/2}\text{Nb}_{1/2})\text{O}_3+0.5 \text{ wt\% CeO}_2$	1575/4h	Complex perovskite Cubic	36.9	20100		-40	823
2680	$\text{La}_4\text{Ti}_9\text{O}_{24}$	1350	Orthorhombic Fddd	37.0	24800	8.1	15	1137, 1138
2681	$\text{Ba}(\text{La}_{1/2}\text{Ta}_{1/2})\text{O}_3$	1625/4h	Complex perovskite	37.0	20950		-36	943
2682	$\text{Ba}(\text{Eu}_{1/2}\text{Ta}_{1/2})\text{O}_3$	1625/4h	Complex perovskite	37.0	41200		-16	943
2683	$\text{Sr}(\text{La}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1575/4h	Complex perovskite	37.0	4000		-20	823
2684	$\text{Sr}(\text{Nd}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1575/4h	Complex perovskite	37.0	20100		-40	823
2685	$0.9\text{Ba}(\text{Co}_{1/3}\text{Nb}_{2/3})\text{O}_3-0.1\text{Ba}(\text{Y}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1380	Perovskite	37.0	25560			1087
2686	$0.35\text{CaTiO}_3-0.65\text{LaAlO}_3$	1600	Perovskite Rhombohedral	37.0	47000		-2	1166
2687	$0.42\text{ZnNb}_2\text{O}_6-0.58\text{TiO}_2+10 \text{ wt\% CuO}$	875	Composite	37.0	17000		-7	1167
2688	$\text{Ba}_2\text{Ti}_9\text{O}_{20}$ (citrate route)	1300/2h	Monoclinic P2 <sub>1</sub> /m	37.0	57000	10.7	-6	1132
2689	$0.9\text{Ba}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3-0.1\text{Ba}(\text{Ga}_{1/2}\text{Ta}_{1/2})\text{O}_3$		Perovskite	37.0	93500	2.9	15	1107
2690	$\text{Ba}(\text{Y}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1600	Complex perovskite	37.0	49600		15	1136
2691	$\text{Zr}_{0.8}\text{Sn}_{0.2}\text{TiO}_4+1 \text{ mol\% Sb}_2\text{O}_5+0.35 \text{ wt\% B}_2\text{O}_3-\text{Li}_2\text{O}+\text{slow cooled}$	1300/5h	Orthorhombic Pbcn	37.0	62000		-	1168
2692	$\text{Ca}_{4.18}\text{Co}_{0.82}\text{Nb}_2\text{TiO}_{12}$	1550	Complex perovskite Orthorhombic Pnma	37.0	30000	4.31	0	230, 1112
2693	$\text{Ca}_{4.85}\text{Zn}_{0.15}\text{Ta}_2\text{TiO}_{12}$	1625	Complex perovskite Orthorhombic Pnma	37.0	35000	4.15	0	230, 1112
2694	$\text{Ca}_{4.82}\text{Mg}_{0.18}\text{Ta}_2\text{TiO}_{12}$	1625	Complex perovskite Orthorhombic Pnma	37.0	36000	4.356	0	230, 1112

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No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
2695	Zr <sub>0.8</sub> Sn <sub>0.2</sub> TiO <sub>4</sub> +2 wt% La <sub>2</sub> O <sub>3</sub> , 1 wt% NiO	1370/2h	Orthorhombic Pbcn	37.0	62000		-9	1169
2696	Zr <sub>0.648</sub> Sn <sub>0.332</sub> TiO <sub>4</sub> +La <sub>2</sub> O <sub>3</sub> +NiO	1370/20h	Orthorhombic Pbcn	37.0	41500		-	1170
2697	3CaO-2MgO-Nb <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub>	1340	Composite	37.0	19000	4.2	-20	230
2698	0.1TeO <sub>2</sub> -SnTe <sub>3</sub> O <sub>8</sub>	670/2h	Cubic Ia3, mixture	37.0	9300		220	62
2699	NdTiSb <sub>x</sub> Ta <sub>1-x</sub> O <sub>6</sub> (x=0.0)	1480/4h		37.0	11200	3.96	54	1101
2700	(KBi) <sub>1/2</sub> MoO <sub>4</sub>	630	Tetragonal I4 <sub>1</sub> /a	37.0	4000	7.5	117	677
2701	0.6Sm(Co <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> -0.4CaTiO <sub>3</sub>	1420	Perovskite	37.0	43000		1	1171
2702	Ba <sub>3</sub> Ti <sub>5</sub> Nb <sub>6</sub> O <sub>28</sub>	1250	Monoclinic P2 <sub>1</sub> /c	37.0	11400		-8	1172
2703	Ba <sub>8</sub> Li <sub>2</sub> Nb <sub>6</sub> O <sub>24</sub>		Hexagonal P6 <sub>3</sub> mmc	37.0	57500			952
2704	Ba <sub>4</sub> LiNb <sub>3-x</sub> Ta <sub>x</sub> O <sub>12</sub> (x=0)	1275	Hexagonal perovskite P6 <sub>3</sub> /mc	37.0	57600		65	941
2705	Ba <sub>8</sub> (Mg <sub>1-x</sub> Zn <sub>x</sub> )Nb <sub>6</sub> O <sub>24</sub> (x=0.6)			37.0	14600		53	1147
2706	La <sub>5</sub> Ti <sub>4</sub> FeO <sub>17</sub>	1500	Orthorhombic Pnnm	37.0	60000		-27	911
2707	Ba(La <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1625	Complex perovskite Orthorhombic	37.1	18200		-35	943
2708	Ba(La <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub> +0.5 wt% Nb <sub>2</sub> O <sub>5</sub>	1575	Complex perovskite Orthorhombic	37.1	20950		-36	845
2709	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>0.8</sub> Ti <sub>0.2</sub> ]O <sub>3-d</sub> +0.5 wt% LMZBS	1125	Complex perovskite Orthorhombic	37.1	22100		2	792
2710	Ba <sub>3-x</sub> Sr <sub>x</sub> LaNb <sub>3</sub> O <sub>12</sub> (x=2)	1415	Trigonal R-3m	37.1	33900		-18	1125
2711	Ba <sub>8</sub> (Mg <sub>1-x</sub> Zn <sub>x</sub> )Nb <sub>6</sub> O <sub>24</sub> (x=0.4)		Not available	37.1	16900		55	1147
2712	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>0.8</sub> Ti <sub>0.2</sub> ]O <sub>3-d</sub> +0.5 wt% LBS	1125	Complex perovskite Orthorhombic	37.2	21800		-5	792
2713	Zr <sub>0.8</sub> Sn <sub>0.2</sub> TiO <sub>4</sub> +1 wt% V <sub>2</sub> O <sub>5</sub>	1300	Orthorhombic Pbcn	37.2	51000	7	-2	1173
2714	0.6CaTiO <sub>3</sub> -0.4NdAlO <sub>3</sub>	1450/10h	Perovskite Orthorhombic	37.2	40750		114	1174
2715	0.7La(Mg <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> -0.3CaTiO <sub>3</sub>	1600	Perovskite Monoclinic P2 <sub>1</sub> /n	37.2	15300	6.3	-54	932
2716	Ba <sub>5</sub> Nb <sub>3</sub> TaO <sub>15</sub>	1435	Hexagonal	37.2	4500		35	1090
2717	Ba(In <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1625	Perovskite	37.2	35500		25	943
2718	Ba(Y <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1625	Perovskite	37.3	45900		120	943
2719	0.6Ca(Al <sub>0.5</sub> Nb <sub>0.5</sub> )O <sub>3</sub> -+0.5SrTiO <sub>3</sub>	1500	Perovskite	37.3	25400		22	1175

2720	0.6Li <sub>2</sub> ZnTi <sub>3</sub> O <sub>8</sub> -0.4TiO <sub>2</sub>	1100	Spinel Cubic+rutile	37.3	11700		102	872
2721	SnTe <sub>3</sub> O <sub>8</sub>	660/2h	Cubic Ia3	37.3	10000		223	62
2722	Bi <sub>12</sub> (B <sub>0.5</sub> P <sub>0.5</sub> )O <sub>20</sub>	780	Sillenite	37.4	850		-19	1176
2723	BaTi <sub>5</sub> O <sub>11</sub> +1 wt% CuO+4 wt% BaCu(B <sub>2</sub> O <sub>5</sub> )	925	Monoclinic P2 <sub>1</sub> /n	37.4	25500		33	1177
2724	Ba(La <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1650	Perovskite	37.4	8000	7.2	-8	590
2725	Sr <sub>2</sub> TiO <sub>4</sub> (Sr <sub>n+1</sub> Ti <sub>n</sub> O <sub>3n+1</sub> )		Perovskite	37.4	8160	3.1	137	1358
2726	Zn <sub>0.5</sub> Ti <sub>0.5</sub> NbO <sub>4</sub>	1100	Orthorhombic Ixiolite Pbcn	37.4	194000		-58	1179
2727	Nd <sub>4</sub> Ti <sub>9</sub> O <sub>24</sub>	1300	Orthorhombic Fddd	37.5	24100	8	65	1137, 1138
2728	Ca <sub>3</sub> Mg <sub>2</sub> Nb <sub>4</sub> TiO <sub>17</sub>	1225		37.5	22500	3.9	-4	877
2729	Sr(Pr <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> +0.5 wt% CeO <sub>2</sub>	1575/4h	Complex perovskite cubic	37.5	3250		-34	823
2730	CeTiSb <sub>x</sub> Ta <sub>1-x</sub> O <sub>6</sub> (x=0.2)	1480		37.5	8400	4	53	1101
2731	Ba <sub>8</sub> Ti <sub>3</sub> Nb <sub>4-x</sub> Sb <sub>x</sub> O <sub>24</sub> (x=1.5)			37.5	38000		15	1178
2732	0.425La <sub>0.97</sub> Sm <sub>0.03</sub> (Mg <sub>0.5</sub> Sn <sub>0.5</sub> )O <sub>3</sub> -0.575Ca <sub>0.8</sub> Sm <sub>0.4/3</sub> TiO <sub>3</sub>	1600		37.5	40300		2	1180
2733	Bi <sub>2</sub> Mo <sub>2</sub> O <sub>9</sub> +3 mol%Y <sub>2</sub> O <sub>3</sub>	640	Monoclinic P2 <sub>1</sub> /n	37.5	14750			1176
2734	ZnTa <sub>2</sub> O <sub>6</sub>	1350	Tri-α PbO <sub>2</sub> Orthorhombic Pbcn	37.6	65200		9	600
2735	Ba(Sm <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1625	Complex perovskite Tetragonal	37.6	15000		-10	943
2736	Ba <sub>5</sub> SrNb <sub>4</sub> ZrO <sub>18</sub>	1600/2h	A <sub>6</sub> B <sub>5</sub> O <sub>18</sub> type perovskite Trigonal R-3m	37.6	36000		68	895
2737	Bi <sub>12</sub> SiO <sub>20</sub>	850	Cubic I23	37.6	8100		-20	1176
2738	Beta-Bi <sub>3</sub> SbO <sub>7</sub>	960	Orthorhombic	37.6	5080		-120	1181
2739	Ca <sub>5</sub> Ta <sub>2</sub> TiO <sub>12</sub> +1 wt% NiO	1625/4h	Complex perovskite Orthorhombic Pnma	37.6	38000		7	1155
2740	Ba(Sm <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub> +0.5 wt% Nb <sub>2</sub> O <sub>5</sub>	1575	Complex Perovskite Tetragonal	37.6	16000		-10	845
2741	CeTiSb <sub>x</sub> Ta <sub>1-x</sub> O <sub>6</sub> (x=0.15)	1480/4h		37.7	9300	3.98	64	1101
2742	Ca <sub>5</sub> Ta <sub>2</sub> TiO <sub>12</sub> +0.5 wt% CuO	1625/4h	Complex perovskite Orthorhombic Pnma	37.7	38000		12	1155
2743	La <sub>6</sub> ZnTi <sub>4</sub> O <sub>18</sub>	1600/4h	A <sub>6</sub> B <sub>5</sub> O <sub>18</sub> type perovskite	37.7	21850		-37	895

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
2744	(Zr <sub>0.8</sub> Sn <sub>0.2</sub> )TiO <sub>4</sub> +1 wt% ZnO, 0.25 wt% WO <sub>3</sub>	1340	Orthorhombic Pbcn	37.8	61000	7	-4	1182
2745	Ba <sub>2</sub> La <sub>2</sub> TiTa <sub>2</sub> O <sub>12</sub>	1520	Trigonal P-3m1 perovskite	37.8	36200	5.7	-52	1183
2746	GdTiTaO <sub>6</sub>	1540	Aeschneite Orthorhombic	37.9	12900		11	583
2747	Gd(W <sub>0.5</sub> Ti <sub>1.5</sub> )O <sub>6</sub>	1375	Orthorhombic Pnma Aeschynite type	37.9	2600		-7	1121
2748	Ca <sub>5</sub> Ta <sub>2</sub> TiO <sub>12</sub> +1 wt% ZnO	1625/4h	Complex perovskite Orthorhombic Pnma	37.9	39000		5	1155
2749	Ca <sub>5-x</sub> Zn <sub>x</sub> Nb <sub>4</sub> TiO <sub>17</sub> (x=0.2)	1340	A <sub>n</sub> B <sub>n</sub> 3 <sub>n+2</sub> type Perovskite P2 <sub>1</sub> /C	37.9	22000		-62	1184
2750	Ba <sub>2</sub> Ti <sub>3</sub> Nb <sub>4</sub> O <sub>18</sub>	1220	Monoclinic P2 <sub>1</sub> /c	38.0	23700	4.8	-3	1185
2751	Zr <sub>0.8</sub> Sn <sub>0.2</sub> TiO <sub>4</sub> +B <sub>2</sub> O <sub>3</sub>		Orthorhombic pbcn	38.0	61500			1186
2752	Bi <sub>2</sub> Mo <sub>2</sub> O <sub>9</sub>	620	Monoclinic P2 <sub>1</sub> /n	38.0	12500		31	494
2753	Ba <sub>2</sub> Ti <sub>9</sub> O <sub>20</sub> (Hydrothermal)	150	Monoclinic P2 <sub>1</sub> /m	38.0	1200	5.6	6	1187
2754	Ca(Zr <sub>x</sub> Ti <sub>1-x</sub> )O <sub>3</sub> (x=0.7)	1470/15h	Perovskite	38.0	2900	3.9	168	916
2755	0.95Ba(Zn <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub> - 0.05Ba(Ga <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>		Perovskite	38.0	102950	2.9	19	1107
2756	Bi <sub>12</sub> GeO <sub>20</sub>	850	Cubic I23 Sillenite	38.0	7800		-31	1176
2757	Ba(Sm <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1625/4h	Complex perovskite	38.0	15000		-10	943
2758	Ba(Ho <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1600	Complex perovskite	38.0	21600		-11	1136
2759	Sr(Pr <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1575/4h	Complex perovskite	38.0	3300		-34	823
2760	Ca <sub>3</sub> Nb <sub>2</sub> O <sub>8</sub>		Tetragonal P4/nnc	38.0	7100	5.9	113	864
2761	Zr <sub>0.8</sub> Sn <sub>0.2</sub> TiO <sub>4</sub>		Orthorhombic Pbcn	38.0	62000	4	0	1188
2762	0.24Li <sub>2</sub> O-0.71Nb <sub>2</sub> O <sub>5</sub> -0.05TiO <sub>2</sub>	1350	M phase	38.0	40000		-99	760
2763	Zr <sub>0.8</sub> Sn <sub>0.2</sub> TiO <sub>4</sub> sol-gel derived	1300	Orthorhombic Pbcn	38.0	55000	6	1	1189
2764	0.5LaCa <sub>0.5</sub> Zr <sub>0.5</sub> O <sub>3</sub> -0.5SrTiO <sub>3</sub>	1575	Composite	38.0	7000	3.8	8	522
2765	BaO-2CeO <sub>2</sub> -3TiO <sub>2</sub>	1250	Composite	38.0	7200		159	909
2766	Ca <sub>5</sub> Ta <sub>2</sub> TiO <sub>12</sub>	1625	Complex perovskite Orthorhombic Pnma	38.0	33000	4.2	10	1190, 1191
2767	Ca <sub>5</sub> Ta <sub>2</sub> TiO <sub>12</sub> +0.2 wt% Al <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub>	1550	Complex perovskite Orthorhombic Pnma	38.0	38000		8	1191

2768	Ca <sub>5</sub> Ta <sub>2</sub> TiO <sub>12</sub> +0.1 wt% 2MgO-Al <sub>2</sub> O <sub>3</sub> -5SiO <sub>2</sub>	1550	Complex perovskite Orthorhombic Pnma	38.0	40000		5	1191
2769	Ba(Zn <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>0.9</sub> Zr <sub>0.1</sub> O <sub>3</sub>	1400	Perovskite Cubic Pm3m	38.0	61000	10	15	1192
2770	Ca <sub>5</sub> Ta <sub>2</sub> TiO <sub>12</sub> +0.5 wt% MgO	1625/4h	Complex perovskite Orthorhombic Pnma	38.0	40000		6	1155
2771	La <sub>0.42</sub> Ca <sub>0.58</sub> [Ca <sub>0.05</sub> Mg <sub>0.16</sub> Ti <sub>0.79</sub> ]O <sub>3</sub>		Perovskite	38.0	20000	5.3	25	950
2772	Ca <sub>(1-x)</sub> Y <sub>x</sub> Ti <sub>1-x</sub> Al <sub>x</sub> O <sub>3</sub> (x=0.3)		Perovskite Orthorhombic	38.0	14200		-14	1193
2773	Ba <sub>0.2</sub> Sr <sub>0.71</sub> (Zr <sub>0.951</sub> Ti <sub>0.039</sub> Ta <sub>0.01</sub> )O <sub>3</sub>		Perovskite Orthorhombic	38.0	1700		0	1194
2774	Ba <sub>0.29</sub> Sr <sub>0.71</sub> (Zr <sub>0.973</sub> Ti <sub>0.027</sub> )O <sub>3</sub>		Perovskite Orthorhombic	38.0	2000		-40	1194
2775	Ba(Zn <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub> +1 mol% WO <sub>3</sub>	1450	Perovskite Cubic Pm3m	38.0	95150		39	1165
2776	0.4Nd <sub>1525/4</sub> Yb <sub>0.04</sub> (Mg <sub>0.5</sub> Sn <sub>0.5</sub> )O <sub>3</sub> - 0.6Ca <sub>0.08</sub> Sr <sub>0.2</sub> TiO <sub>3</sub> +1.25 wt% B <sub>2</sub> O <sub>3</sub>	1525/4h	Composite	38.0	68600		2	1195
2777	Ba <sub>2</sub> Ti <sub>3</sub> Nb <sub>4</sub> O <sub>18</sub>		Monoclinic P2 <sub>1</sub> /c	38.1	14200		-11	1196
2778	Ba <sub>3</sub> Ti <sub>5</sub> Nb <sub>6</sub> O <sub>28</sub> +BaCu(B <sub>2</sub> O <sub>5</sub> )	925	Monoclinic P2 <sub>1</sub> /c	38.2	19200		12	1172
2779	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>0.8</sub> Ti <sub>0.2</sub> ]O <sub>3-d</sub> +0.2 wt% LBS	1125	Complex perovskite Orthorhombic	38.2	21500		-2	792
2780	Ba <sub>4</sub> NdTiNb <sub>3</sub> O <sub>15</sub>	1430/3h	Hexagonal perovskite	38.2	18700	5.4	12	1352
2781	BaO-ZnO-TiO <sub>2</sub>	1250		38.2	5000		36	1117
2782	Sr <sub>1-x</sub> Ca <sub>x</sub> [(Li <sub>1/4</sub> Nb <sub>3/4</sub> ) <sub>1-y</sub> Ti <sub>y</sub> ]O <sub>3</sub>		Perovskite	38.2- 45.8	35000		30 to -70	1197
2783	0.7La(Mg <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> -0.3SrTiO <sub>3</sub>		Perovskite Pbnm	38.3	10550	6.6		978
2784	0.87La(Mg <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> - 0.13Ca <sub>0.8</sub> Sr <sub>0.2</sub> TiO <sub>3</sub> +0.5 wt% B <sub>2</sub> O <sub>3</sub>	1475	Composite	38.3	67000	8	0	1198
2785	Zn <sub>0.97</sub> Co <sub>0.03</sub> Ta <sub>2</sub> O <sub>6</sub>		Orthorhombic Pbcn	38.3	109200		10	1077
2786	PrTiSb <sub>x</sub> Ta <sub>1-x</sub> O <sub>6</sub> (x=0.15)	1480/4h	Not available	38.3	12300	4.05	60	1101
2787	0.4Nd(Mg <sub>0.4</sub> Zn <sub>0.1</sub> Sn <sub>0.5</sub> )O <sub>3</sub> - 0.6Ca <sub>0.8</sub> Sr <sub>0.2</sub> TiO <sub>3</sub>	1350/4h	Composite	38.3	35000		-5	1199
2788	Ba(Zn <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub> +1 mol%WO <sub>3</sub> annealed at 1325	1450/4h	Perovskite Cubic Pm3m	38.4	95150		38	1165

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
2789	Ba(Pr <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1625	Complex perovskite Orthorhombic	38.5	42800		-8	943
2790	Sm(Nb <sub>0.25</sub> Ta <sub>0.75</sub> )TiO <sub>6</sub>			38.5	22100		26	671
2791	Zn <sub>0.95</sub> Co <sub>0.05</sub> Ta <sub>2</sub> O <sub>6</sub>		Orthorhombic Pbcn	38.5	112000		11	1077
2792	(Zn <sub>0.95</sub> Mn <sub>0.05</sub> )Ta <sub>2</sub> O <sub>6</sub>	1325	Orthorhombic Pbcn	38.5	92700		9	1200
2793	Ba(Pr <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub> +0.5 wt% Nb <sub>2</sub> O <sub>5</sub>	1575	Complex perovskite Orthorhombic	38.5	47150		-39	845
2794	(Sm <sub>0.5</sub> Y <sub>0.5</sub> )(Ti <sub>1.5</sub> W <sub>0.5</sub> )O <sub>6</sub>	1400/10h	Not available	38.5	36900		-6	1201
2795	Eu(W <sub>0.5</sub> Ti <sub>1.5</sub> )O <sub>6</sub>	1375	Orthorhombic Pnma Aeschynite type	38.6	30500		3	1121
2796	0.5Ba(Y <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> - 0.5Ba(Ca <sub>1/9</sub> Y <sub>3/9</sub> Nb <sub>5/9</sub> )O <sub>3</sub>		Perovskite	38.6	17400	8.1		1202
2797	MWF-38	1360	Composite	38.6	44500		1.3	510
2798	Bi <sub>12</sub> PbO <sub>19</sub>		Cubic I23 sillenite	38.6	2900		-84	1176
2799	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>1-x</sub> Ti <sub>x</sub> ]O <sub>3</sub> (x=0.2)	1150/3h	Perovskite	38.6	26100		0	752
2800	Ba <sub>3</sub> Ti <sub>5</sub> Nb <sub>6</sub> O <sub>28</sub> +3 wt% B <sub>2</sub> O <sub>3</sub> +1 wt% CuO	900/2h	Monoclinic P2 <sub>1</sub> /c	38.6	29800		5	1203
2801	Ca <sub>5</sub> Ta <sub>2</sub> TiO <sub>12</sub> +0.5 wt% Al <sub>2</sub> O <sub>3</sub>	1625/4h	Complex perovskite Orthorhombic Pnma	38.6	36000		6	1155
2802	Ca(Fe <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1250/3h	Perovskite Orthorhombic Pbnm	38.6	1830	5.9	-107	1164
2803	Ba(Nd <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub> +0.5 wt% Nb <sub>2</sub> O <sub>5</sub>	1575	Complex perovskite Tetragonal	38.7	12050		-4	845
2804	Zr <sub>0.8</sub> Sn <sub>0.2</sub> TiO <sub>4</sub> +1 wt% ZnO+0.2 wt% B <sub>2</sub> O <sub>3</sub>	1150/3h	Orthorhombic Pbcn	38.7	61500			1186
2805	PrTiSb <sub>x</sub> Ta <sub>1-x</sub> O <sub>6</sub> (x=0.1)	1480/4h		38.7	12800	4.02	64	1101
2806	Bi <sub>4</sub> B <sub>2</sub> O <sub>9</sub>	660	Monoclinic P2 <sub>1</sub> /c	38.8	2620		-203	287
2807	Ba(Eu <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1625	Complex perovskite	38.8	36200		-10	943
2808	Ba(Dy <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1600	Complex perovskite	38.9	20600		-4	1136
2809	Zr <sub>0.8</sub> Sn <sub>0.2</sub> TiO <sub>4</sub>	1600/4h	Orthorhombic Pbcn	38.9	51500		0.7	1204
2810	Ba <sub>3-x</sub> Sr <sub>x</sub> LaNb <sub>3</sub> O <sub>12</sub> (x=1.5)	1405	Hexagonal perovskite R-3m	38.9	25800		-35	1125

2811	ZnTiNb <sub>2</sub> O <sub>8</sub> -0.8TiO <sub>2</sub> +2 wt% BaCu(B <sub>2</sub> O <sub>5</sub> )	950	Orthorhombic Pbcn	38.9	14500	4.71	0	1205
2812	Ba(In <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> +MoO <sub>3</sub> additive	1600	Complex perovskite	39.0	30700		17	1136
2813	Ba <sub>5</sub> Nb <sub>4</sub> O <sub>15</sub> (A <sub>n</sub> B <sub>n-1</sub> O <sub>3n</sub> )	1380	Hexagonal perovskite P-3m1	39.0	23700	4.7	78	325
2814	Ba <sub>5</sub> Nb <sub>4</sub> O <sub>15</sub> +6.3 vol% BaNb <sub>2</sub> O <sub>6</sub> +3 wt% B <sub>2</sub> O <sub>3</sub>	925/2h	Composite	39.0	18700		0	1206
2815	(1-x)Ba <sub>3</sub> (ZnNb <sub>2</sub> )O <sub>9</sub> -xBa <sub>3</sub> W <sub>2</sub> O <sub>9</sub> (x=0.007)	1380	Perovskite	39.0	118000		21	1207
2816	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>1-x</sub> Ti <sub>x</sub> ] O <sub>3-δ</sub> (x=0.15)	1150/3h	Perovskite	39.0	26100		0	752
2817	Ba(Tb <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1600	Complex perovskite	39.0	52400		-2	1136
2818	Ba <sub>3</sub> Ti <sub>5</sub> Ta <sub>6</sub> O <sub>28</sub>	1430		39.0	4000	5.3	30	1208
2819	Ca <sub>4</sub> SrTa <sub>2</sub> TiO <sub>12</sub>	1625	Complex Perovskite Orthorhombic Pnma	39.0	21000	3.59	12	1209
2820	Ba(Mn <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub>		Trigonal P-3m1 Perovskite	39.0	9300	9.3	27	787
2821	Ba <sub>4</sub> LaSnNb <sub>3</sub> O <sub>15</sub> (A <sub>5</sub> B <sub>4</sub> O <sub>15</sub> )	1480/4h	Hexagonal perovskite	39.0	14800	5.9	-29	1210
2822	(1-x)LaMg <sub>1/2</sub> Ti <sub>1/2</sub> -xLa <sub>2/3</sub> TiO <sub>3</sub> (x=0.48)		Perovskite	39.0	3800	4.6	23	950
2823	Li <sub>0.774</sub> Zr <sub>0.057</sub> NbO <sub>3</sub>	1150	Orthorhombic Pnma	39.0	4500	6	-17	1070
2824	Ca <sub>5</sub> Ta <sub>2</sub> TiO <sub>12</sub> +0.1 wt% 2MgO-Al <sub>2</sub> O <sub>3</sub> -5SiO <sub>2</sub>	1600	Perovskite Orthorhombic Pnma	39.0	40000	5	8	1211
2825	Ca <sub>5</sub> Ta <sub>2</sub> TiO <sub>12</sub> +0.1 wt% B <sub>2</sub> O <sub>3</sub> -Al <sub>2</sub> O <sub>3</sub> -5SiO <sub>2</sub>	1600	Complex perovskite Orthorhombic Pnma	39.0	38000	5	7	1211
2826	Ca <sub>5</sub> Ta <sub>2</sub> TiO <sub>12</sub> +0.1 wt% SiO <sub>2</sub>	1600	Complex perovskite Orthorhombic Pnma	39.0	35000	5	9	1211
2827	Ca <sub>5</sub> Ta <sub>2</sub> TiO <sub>12</sub> +1 wt% SnO <sub>2</sub>	1625/4h	Complex perovskite Orthorhombic Pnma	39.0	35500		2	1155
2828	Ca <sub>5</sub> Ta <sub>2</sub> TiO <sub>12</sub> +1 wt% Cr <sub>2</sub> O <sub>3</sub>	1625/4h	Complex perovskite Orthorhombic Pnma	39.0	40500		13	1155
2829	Ca <sub>5</sub> Ta <sub>2</sub> TiO <sub>12</sub> +1 wt% In <sub>2</sub> O <sub>3</sub>	1625/4h	Complex perovskite Orthorhombic Pnma	39.0	37000		2	1155
2830	SrTiO <sub>3</sub> -LaAlO <sub>3</sub>		Perovskite	39.0	60000		0	1212

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
2831	Sr(Sm <sub>0.5</sub> Ta <sub>0.5</sub> )O <sub>3</sub> +0.5 wt% Nb <sub>2</sub> O <sub>5</sub> +2 wt% TiO <sub>2</sub>	1600/4h	Complex perovskite Tetragonal	39.0	11600		-20	859
2832	BaMg <sub>6</sub> Ti <sub>6</sub> O <sub>19</sub>	1450	Hexagonal P6 <sub>3</sub> /mmc	39.0	20000	2	370	1213
2833	Ba <sub>2</sub> Ti <sub>9</sub> O <sub>20</sub>	1350/3h	Monoclinic P2 <sub>1</sub> /m	39.0	32000	2		1214, 1215
2834	Ba <sub>5</sub> Nb <sub>4</sub> O <sub>15</sub> +3 wt% B <sub>2</sub> O <sub>3</sub>	925	Perovskite Hexagonal P-3m1	39.0	18700		0	1206
2835	Bi <sub>2</sub> Te <sub>2</sub> O <sub>8</sub> (oxygen atm)	650/10h	Monoclinic C2/c	39.0	23000		-43	1216
2836	0.9BiNbO <sub>4</sub> -0.1ZnNb <sub>2</sub> O <sub>6</sub> +0.8CuV <sub>2</sub> O <sub>6</sub>	900	Mixture phases	39.0	31000		-10	1217
2837	Ba <sub>9/12</sub> La <sub>3/12</sub> Zn <sub>1/3</sub> Ti <sub>3/12</sub> Nb <sub>5/12</sub> O <sub>3</sub>	1400		39.0	1500	5.46	-42	919
2838	Sr <sub>2</sub> La <sub>2</sub> TiNb <sub>2</sub> O <sub>12</sub>	1450	Hexagonal perovskite	39.0	40600		-5	1143
2839	Sr <sub>4-m</sub> La <sub>m</sub> Ti <sub>m-1</sub> Ta <sub>4-m</sub> O <sub>12</sub> (m=3)	1600		39.0	42000		-8	975
2840	0.6La(Mg <sub>1/2</sub> Ti <sub>1/2</sub> )TO <sub>3</sub> -0.4Ca <sub>0.6</sub> Nd <sub>0.8/3</sub> TiO <sub>3</sub> +0.5 wt% B <sub>2</sub> O <sub>3</sub>	1475	Composite	39.0	41000	8	-3	1218
2841	Bi <sub>11.8</sub> SiO <sub>19.7</sub>	825/4h	Cubic I23	39.0	74000		-14	1219
2842	Bi <sub>4</sub> B <sub>2</sub> O <sub>9</sub>	660	Monoclinic P2 <sub>1</sub> /c	39.0	2600		-203	287
2843	Ba(Dy <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1625	Complex perovskite	39.1	18200		-48	943
2844	0.8BaZn <sub>2</sub> Ti <sub>4</sub> O <sub>11</sub> -0.2BaNd <sub>2</sub> Ti <sub>4</sub> O <sub>12</sub>	1250	Composite	39.1	37850		-9	1220
2845	(Zr <sub>0.8</sub> Sn)TiO <sub>4</sub> +2 wt% ZST nano	1300/3h	Orthorhombic Pbcn	39.2	72900		-	1221
2846	Sr <sub>1.6</sub> Ca <sub>0.4</sub> TiO <sub>4</sub>	1600	Tetragonal I4/mmm	39.2	8100	3	195	1222
2847	(5-x)BaO-xMgO-2Nb <sub>2</sub> O <sub>5</sub> (x=1)+1 wt% CuO	1200	Composite	39.2	43800		38	1159
2848	Sr <sub>2</sub> La <sub>4</sub> Ti <sub>5</sub> O <sub>18</sub>	1625/2h	A <sub>6</sub> B <sub>5</sub> O <sub>18</sub> type perovskite	39.2	27350		20	895
2849	Sm(Nb <sub>0.5</sub> Ta <sub>0.5</sub> )TiO <sub>6</sub>			39.3	19600		33	671
2850	Ca <sub>5</sub> Ta <sub>2</sub> TiO <sub>12</sub> +1 wt% Sb <sub>2</sub> O <sub>3</sub>	1625/4h	Complex perovskite Orthorhombic Pnma	39.3	36800		7	1155
2851	Ba <sub>2</sub> Ti <sub>9</sub> O <sub>20</sub> +1.64 mol%SnO <sub>2</sub> in O <sub>2</sub>	1390/6h	Monoclinic P-1	39.3	38400		-	1223
2852	Ba <sub>3</sub> LaTa <sub>3</sub> O <sub>12</sub>	1500	A <sub>n</sub> B <sub>n-1</sub> O <sub>3n</sub> perovskite Trigonal R3m	39.4	26800	6	-46	1224

2853	$\text{Bi}_{12}\text{MnO}_{20-d}$	720	Cubic I23 Sillimanite	39.4	800		-35	1176
2854	$\text{PrTiSb}_x\text{Ta}_{1-x}\text{O}_6$ ( $x=0.05$ )	1480/4h		39.4	14800	4.001	65	1101
2855	$\text{Sm}(\text{W}_{0.5}\text{Ti}_{1.5})\text{O}_6$	1350	Orthorhombic Pnma Aeschnyrite type	39.4	35500		-1	1121
2856	$5.7\text{Li}_2\text{O}-\text{Nb}_2\text{O}_5-7.3\text{TiO}_2$	1100	M phase	39.5	16200		65	1225
2857	$\text{CeTiSb}_x\text{Ta}_{1-x}\text{O}_6$ ( $x=0$ )			39.5	11400	3.81	60	1101
2858	$\text{Ba}_{3-x}\text{Sr}_x\text{LaNb}_3\text{O}_{12}$ ( $x=1$ )	1400	Perovskite Trigonal R-3m	39.5	22600		-56	1125
2859	$\text{Ba}_{1-x}\text{La}_x[\text{Zn}_{(1+x)/3}\text{Nb}_{(2-x)/3}]\text{O}_3$ ( $x=0$ )	1350/4h		39.5	112280		19	1226
2860	$\text{Ba}_2\text{Ti}_9\text{O}_{20}+1.64$ mol% $\text{ZrO}_2$	1390/6h	Monoclinic $\text{P}2_1/\text{m}$	39.5	41700		2	1227
2861	$\text{Ba}_5\text{SrNb}_4\text{ZrO}_{18}$	1600/4h	Trigonal R-3m	39.5	36000		68	895
2862	$\text{Ba}[\text{Zn}_{1/4}\text{Ti}_{1/4}\text{Ta}_{1/2}]\text{O}_3$	1500	Perovskite cubic	39.6	15000	7.4		1228
2863	$0.6\text{La}_{2/3}\text{TiO}_3-0.4\text{LaAlO}_3$	1400/33h	Perovskite Orthorhombic	39.6	42200	6	-15	1096
2864	$\text{Ba}(\text{Ho}_{1/2}\text{Ta}_{1/2})\text{O}_3$	1625	Complex perovskite	39.6	21900		130	943
2865	$\text{PrTiSb}_x\text{Ta}_{1-x}\text{O}_6$ ( $x=0.0$ )	1480/4h		39.6	12500	3.97	56	1101
2866	$0.95\text{Ba}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3-0.05\text{BaZrO}_3+1$ wt% $\text{CuO}$	1360/2h	Perovskite cubic $\text{Pm}3\text{m}$	39.7	70000	7	17	1229
2867	$\text{Ba}(\text{Sm}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1500	Complex perovskite	39.7	21500	7.1	21	590
2868	$(1-x)\text{La}(\text{Mg}_{1/2}\text{Ti}_{1/2})\text{O}_3-x\text{La}_{2/3}\text{TiO}_3$ ( $x=0.45$ )		Perovskite $\text{I}2/\text{a}$	39.7	5800	7.6		889
2869	$\text{Ba}(\text{Yb}_{1/2}\text{Ta}_{1/2})\text{O}_3$	1625	Complex perovskite	39.7	31700		112	943
2870	$0.65\text{CaTiO}_3-0.35\text{Sm}_{0.9}\text{Nd}_{0.1}\text{AlO}_3$	1415/3h	Orthorhombic Perovskite	39.7	50000		-7	1230
2871	$\text{Ba}_6\text{Ti}_{1-x}\text{Sn}_x\text{Nb}_4\text{O}_{18}$ ( $x=0.25$ )	1480	Hxagonal R-3m	39.8	19800	5.5	46	982
2872	$\text{GdTiTaO}_6$	1540		39.9	12900		11	583
2873	$\text{Ba}(\text{Gd}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1600	Complex perovskite	40.0	5700		5	1136
2874	$\text{Ca}_5\text{Nb}_{0.5}\text{Ta}_{1.5}\text{TiO}_{12}$	1600	Complex perovskite Orthorhombic Pnma	40.0	31500		19	1231
2875	$\text{Ba}(\text{Eu}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1600	Complex perovskite	40.0	40200		7	1136
2876	$\text{Ba}_3\text{Ti}_5\text{Nb}_3\text{Ta}_3\text{O}_{28}$	1375		40.0	8000	4.8	9	1208
2877	$\text{Ba}_5\text{Nb}_4\text{O}_{15}$	—	Trigonal perovskite $\text{P}-3\text{m}1$	40.0	53000		78	1232-1234
2878	$\text{Ca}_4\text{ZnNb}_2\text{TiO}_{12}$	1550	Perovskite Orthorhombic Pnma	40.0	30500	4.2458	-37	230

(continued)



No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
2879	$\text{Sr}_5\text{Nb}_4\text{O}_{15}(\text{A}_n\text{B}_{n-1}\text{O}_{3n})$	1400	Trigonal P-3c1 perovskite	40.0	19400	4.84	55	325
2880	$\text{Ca}(\text{Fe}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1500/6h	Complex perovskite Orthorhombic Pbnm	40.0	20000		-76	609
2881	$\text{Ca}[(\text{Li}_{1/3}\text{Nb}_{2/3})_{0.8}\text{Ti}_{0.2}]\text{O}_{3-\delta}$	920	Orthorhombic perovskite	40.0	20500	8	5	1235
2882	$\text{Ca}[(\text{Li}_{1/3}\text{Nb}_{2/3})_{0.8}\text{Ti}_{0.2}]\text{O}_{3-\delta}+12$ wt% $\text{B}_2\text{O}_3$ -ZnO-SiO <sub>2</sub> -PbO frit glass	900	Composite	40.0	12500		-8	1236
2883	$\text{Sr}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3$		Perovskite Cubic Pm3m	40.0	36800	9.2	-39	787
2884	$0.3\text{Sr}(\text{Eu}_{1/2}\text{Nb}_{1/2})\text{O}_3-0.7\text{Sr}(\text{Fe}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1600/4h	Complex perovskite	40.0	22600		-4	823
2885	$\text{Ba}[(\text{Zn}_{0.8}\text{Co}_{0.2})_{1/3}\text{Nb}_{2/3}]\text{O}_3$	1410	Perovskite Cubic Pm3m	40.0	50135		18	1130
2886	$\text{Ba}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3$	1390	Perovskite Cubic Pm3m	40.0	87000		30	787, 1237
2887	$\text{Ba}_{0.3}\text{Sr}_{0.7}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3$	1500/1h	Perovskite Cubic Pm3m	40.0	30500	10	-5	1238
2888	$0.7\text{Ca}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3-0.3\text{CaTiO}_3$		Perovskite	40.0	27900	3.8	-15	1238
2889	$(\text{Zr},\text{Sn})\text{TiO}_4$	1600	Orthorhombic Pbcn	40.0	53000	10	0	1240
2890	$\text{Ba}_8\text{Ta}_{4+0.8x}\text{Ti}_{3-x}\text{O}_{24}$ (x=0)	1400/40h	$\text{A}_n\text{B}_{n-1}\text{O}_{3n}$ hexagonal Perovskite P63/mcm	40.0	12960			920
2891	$0.6\text{La}_{2/3}\text{TiO}_3-0.4\text{LaAlO}_3$ (oxygen)	1400/33h	Perovskite Orthorhombic	40.0	50800	6	-15	1096
2892	$\text{Ba}_{0.75}\text{Sr}_{0.25}(\text{Zn}_{1/3}\text{Ta}_{2/3})_{0.94}\text{Ti}_{0.06}\text{O}_3$	1400	Perovskite	40.0	65000	10	-13	1194
2893	$\text{Ba}_5\text{Nb}_4\text{O}_{15}+0.3$ wt% $\text{ZnB}_2\text{O}_4$ glass	900	Hexagonal Perovskite	40.0	12100		48	1241
2894	$\text{Ba-Nd-Sm-Bi-Ti-O}+9$ wt% $\text{BaO-B}_2\text{O}_3\text{-SiO}_2$	950/2.5h	Composite	40.0	3000			1242
2895	$\text{ZnNb}_2\text{O}_6-1.8\text{TiO}_2+4$ wt% $\text{BaCu}(\text{B}_2\text{O}_5)$	950/4h	Composite	40.0	11000		2	626
2896	$\text{Bi}(\text{V}_{0.008}\text{Nb}_{0.992})\text{O}_4$	830	Orthorhombic Pnma	40.0	18500			1243
2897	$\text{La}(\text{Mg}_{0.3}\text{Ti}_{0.5})\text{O}_3+15$ mol% $\text{Bi}_2\text{O}_3$	1325	Composite	40.1	60200		70	1244
2898	$\text{Ca}_5\text{Ta}_4\text{TiO}_{17}$	1525	Monoclinic P2 <sub>1</sub> /c	40.1	16450	4.22	-54	877, 1245
2899	$\text{Ba}_3\text{Ti}_5\text{Nb}_6\text{O}_{28}+2$ wt% $\text{B}_2\text{O}_3+2$ wt% $\text{CuO}$	900/2h	Monoclinic P2 <sub>1</sub> /c	40.2	32200		5	461
2900	$\text{La}_6\text{MgTi}_4\text{O}_{18}$	1625/2h		40.2	35000		-39	895
2901	$\text{Ba}_5\text{Nb}_4\text{O}_{15}+1.5$ wt% $\text{BaCu}(\text{B}_2\text{O}_5)$		Hexagonal perovskite	40.2	28600		60	1246
2902	$\text{BaO-CeO}_2-3\text{TiO}_2$	1300	Composite	40.3	19900		22	1247

2903	Ba(Zn <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub> +1 mol% ZrO <sub>2</sub> annealed at 1325	1450/4h	Complex perovskite trigonal	40.3	77800		26	1165
2904	Ba <sub>3</sub> Ti <sub>5</sub> Nb <sub>6</sub> O <sub>28</sub> +1 wt% B <sub>2</sub> O <sub>3</sub> +3 wt% CuO	900/2h	Monoclinic P2 <sub>1</sub> /c	40.3	32500		9	461
2905	2.5ZnO-0.2SnO <sub>2</sub> -4.8TiO <sub>2</sub> -2.5Nb <sub>2</sub> O <sub>5</sub> +4 wt% BaCu(B <sub>2</sub> O <sub>5</sub> )	900	Composite	40.4	19000		-1	1248
2906	5.7Li <sub>2</sub> O-Nb <sub>2</sub> O <sub>5</sub> -7.3TiO <sub>2</sub> +1 wt% B <sub>2</sub> O <sub>3</sub>	900	M phase+Li <sub>2</sub> TiO <sub>3</sub>	40.5	13900		42	1225
2907	ZnTi(Nb <sub>1-x</sub> Ta <sub>x</sub> ) <sub>2</sub> O <sub>8</sub> (x=0.8)	1200/2h	Orthorhombic Pbcn	40.5	41000		0	1249
2908	Ca <sub>4</sub> La <sub>2</sub> Ti <sub>5-x</sub> (Mg <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>x</sub> O <sub>17</sub> (x=3)	1540	Orthorhombic Pbnm	40.5	19100		1	1118
2909	BaTi <sub>5</sub> O <sub>11</sub> +1 wt% CuO	1100	Monoclinic P2 <sub>1</sub> /n	40.5	44500		39	1177
2910	Ca <sub>4</sub> MgNb <sub>4</sub> TiO <sub>17</sub>	1250		40.6	18250		1.5	877
2911	Ga <sub>0.5</sub> Ta <sub>0.5</sub> TiO <sub>4</sub>	1400	Tetragonal P42/mnm	40.6	17500		110	1250
2912	BiNb <sub>0.6</sub> Sb <sub>0.4</sub> O <sub>4</sub>	920	Orthorhombic Pnna	40.7	9500		-31	1251
2913	Zr <sub>0.8</sub> Sn <sub>0.2</sub> TiO <sub>4</sub> +1 wt% ZnO+1 mol% Sb <sub>2</sub> O <sub>5</sub>	1400/5h	Orthorhombic Pbcn	40.8	60900			1252
2914	5.5Li <sub>2</sub> O-Nb <sub>2</sub> O <sub>5</sub> -7.5TiO <sub>2</sub> +1 wt% B <sub>2</sub> O <sub>3</sub>	875		40.8	15500	5.78	50	1253
2915	La <sub>6</sub> ZnTi <sub>4</sub> O <sub>18</sub>	1600/4h		40.8	21900		-37	895
2916	Ni <sub>0.35</sub> Zn <sub>0.65</sub> TiNb <sub>2</sub> O <sub>8</sub>	1100/6h	-	40.9	40900		1	1254
2917	0.8ZrO <sub>2</sub> -0.4(Zn <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>2</sub> -0.8TiO <sub>2</sub>	1320/3h		40.9	43300		-4	1255
2918	5Li <sub>2</sub> O-1Nb <sub>2</sub> O <sub>5</sub> -5TiO <sub>3</sub> +1 wt% B <sub>2</sub> O <sub>3</sub>	900		41.0	9880		43	1256
2919	Ba <sub>2</sub> Ti <sub>3</sub> Nb <sub>4</sub> O <sub>18</sub> + 1.5 wt% MnCO <sub>3</sub> -CuO+0.5 wt% LBS	900/2h	Composite	41.0	15000	4.8	4	1185
2920	Ba <sub>1/2</sub> La <sub>1/2</sub> Zn <sub>1/3</sub> Ti <sub>1/2</sub> Nb <sub>1/6</sub> O <sub>3</sub>	1400		41.0	1550	5.04	18	919
2921	SrLa <sub>3</sub> Ti <sub>2</sub> NbO <sub>12</sub>	1480	Hexagonal perovskite	41.0	33600		3	1143
2922	Ba <sub>2</sub> Ti <sub>9</sub> O <sub>20</sub> :Mn		Monoclinic P2 <sub>1</sub> /m	41.0	45000	9	2	1254
2923	Ba(Zn <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub> +1 mol% CeO <sub>2</sub> annealed at 1325	1450/4h	Complex perovskite Cubic Pm3m	41.0	69500		41	1165
2924	Ca <sub>4.35</sub> Mg <sub>0.65</sub> Nb <sub>2</sub> TiO <sub>12</sub>	1550	Orthorhombic perovskite Pnma	41.0	33000	4.1	0	230
2925	Ba(Zn <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub> Annealed in N <sub>2</sub>	1500	Perovskite cubic Pm3m	41.0	90000		4	787
2926	(Ti <sub>0.8</sub> Sn <sub>0.2</sub> )Te <sub>3</sub> O <sub>8</sub>	700/5h	Cubic Ia3	41.0	22000	4		53
2927	Bi <sub>0.95</sub> Sm <sub>0.05</sub> NbO <sub>4</sub>	1040	Orthorhombic Pnma	41.0	5200		-200	1258

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
2928	$\text{Bi}_{12}\text{TiO}_{20}$	800/5h	Cubic I23 sillenite	41.0	10400		-11	1176, 1259
2929	0.65CaTiO <sub>3</sub> -0.35SmAlO <sub>3</sub>	1450/12h	Perovskite Orthorhombic	41.0	42000		-18	1174
2930	0.9BiNbO <sub>4</sub> -0.12ZnNb <sub>2</sub> O <sub>6</sub> +1.2 wt% CuV <sub>2</sub> O <sub>6</sub>	850	Composite	41.0	28120		4	1217
2931	BaTi <sub>5</sub> O <sub>11</sub> (hot pressed)	1050/48	Monoclinic P2 <sub>1</sub> /n	41.0	46000	10	40	1260
2932	0.65CaTiO <sub>3</sub> -0.35LaAlO <sub>3</sub>	1450/12h	Perovskite Orthorhombic	41.0	33000		-17	1174
2933	Sr <sub>5</sub> Ta <sub>4</sub> O <sub>15</sub> (A <sub>n</sub> B <sub>n-1</sub> O <sub>3n</sub> )	1610	Hexagonal perovskite P-3m1	41.0	2400	5.99	-	325
2934	Ca <sub>3</sub> Nb <sub>2</sub> O <sub>8</sub>		Cubic	41.0	8700	8.6	123	864
2935	Ba <sub>3</sub> Ti <sub>5</sub> Nb <sub>6</sub> O <sub>28</sub>	1300	Monoclinic P2 <sub>1</sub> /c	41.0	4500	5.4	8	1208
2936	Zr <sub>0.513</sub> Hf <sub>0.487</sub> TiO <sub>4</sub>	1600	Orthorhombic Pbcn	41.0	20400		13	1057
2937	5CaO-2Ta <sub>2</sub> O <sub>5</sub>	1550	Mixed phases	41.0	5900	5.9	140	325
2938	NaCa <sub>4</sub> Ta <sub>5</sub> O <sub>17</sub>	1350	Monoclinic (P21/b)	41.0	11600		-14	1261
2939	CaLa <sub>4</sub> Ti <sub>4</sub> O <sub>15</sub> (A <sub>n</sub> B <sub>n-1</sub> O <sub>3n</sub> )	1550/24h	Hexagonal perovskite P-3c1	41.1	50240		-25	1262
2940	CaTi <sub>0.4</sub> (Al <sub>1/2</sub> Nb <sub>1/2</sub> ) <sub>0.6</sub> O <sub>3</sub> +1 wt% Li <sub>3</sub> NbO <sub>4</sub>	1300/5h	Perovskite Orthorhombic	41.1	36200	7	-36	1152
2941	Ba(Zn <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub>	1390	Perovskite Cubic Pm3m	41.1	86900	9.5	31	787, 1238
2942	BaTi <sub>5</sub> O <sub>11</sub> (reaction sintering)	1100	Monoclinic P2 <sub>1</sub> /n	41.2	47400		36	1263
2943	0.4La(Mg <sub>0.4</sub> Sr <sub>0.1</sub> Sn <sub>0.5</sub> )O <sub>3</sub> - 0.6Ca <sub>0.8</sub> Sr <sub>0.2</sub> TiO <sub>3</sub>	1550/4h	Composite	41.2	56900		-6	1264
2944	CaTi <sub>0.4</sub> (Al <sub>1/2</sub> Nb <sub>1/2</sub> ) <sub>0.6</sub> O <sub>3</sub>	1500/5h	Perovskite Orthorhombic	41.3	27100	7	-44	1152
2945	EuTiTaO <sub>6</sub>	1525	Aeschnite Orthorhombic	41.3	59500		19	583
2946	Li <sub>2</sub> O-Nb <sub>2</sub> O <sub>5</sub> -TiO <sub>2</sub> (5:1:5)+1 wt% B <sub>2</sub> O <sub>3</sub>	900		41.3	9320			1140
2947	ZnO.Nb <sub>2</sub> O <sub>5</sub> -0.08SnO <sub>2</sub> -1.92TiO <sub>2</sub> +1 mol% MnO <sub>2</sub> +4 wt% BaCuB <sub>2</sub> O <sub>5</sub>	850	composite	41.3	1690		-16	1265
2948	CaTi <sub>0.5</sub> (Al <sub>1/2</sub> Ta <sub>1/2</sub> ) <sub>0.5</sub> O <sub>3</sub>	1500/15h	Perovskite Orthorhombic	41.4	26100	8	-20	1266
2949	Zn <sub>0.7</sub> Ni <sub>0.3</sub> TiNb <sub>2</sub> O <sub>8</sub>	1125/4h	Orthorhombic Pbcn	41.4	31800		-9	1267
2950	Ba <sub>0.9</sub> Ca <sub>0.1</sub> (Y <sub>0.285</sub> Nb <sub>1/2</sub> )O <sub>3+δ</sub>		Perovskite	41.5	48860	7.85	258	1202
2951	BiNbO <sub>4</sub> :0.4 wt% B <sub>2</sub> O <sub>3</sub>	960/2h	Orthorhombic Pnma	41.5	21000		-2	1268
2952	0.7CaTiO <sub>3</sub> -0.3(La <sub>0.5</sub> Nd <sub>0.5</sub> )AlO <sub>3</sub>		Rhombic perovskite	41.5	37000	8	4	1269
2953	Ca <sub>2</sub> Zn <sub>4</sub> Ti <sub>15</sub> O <sub>36</sub> +8 wt% B <sub>2</sub> O <sub>3</sub>	990	Hexagonal	41.5	11400		95	1270

2954	Ca[Ti <sub>1-x</sub> (Mg <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>x</sub> ]O <sub>3</sub> (x=0.7)	14504h		41.6	29450		-12	1271
2955	Sm(Nb <sub>0.75</sub> Ta <sub>0.25</sub> )TiO <sub>6</sub>			41.6	18900		36	671
2956	CaLa <sub>4</sub> Ti <sub>3</sub> O <sub>15</sub>	1450	A <sub>n</sub> B <sub>n-1</sub> O <sub>3n</sub> Hexagonal Perovskite P-3m	41.6	8100	4.31	-25	1272
2957	5Li <sub>2</sub> O-Nb <sub>2</sub> O <sub>5</sub> -5TiO <sub>2</sub> +1 wt% V <sub>2</sub> O <sub>5</sub>	900/6h	M phase+Li <sub>2</sub> TiO <sub>3</sub>	41.7	7800		45	1273
2958	(LiBi) <sub>1/2</sub> MoO <sub>4</sub>	560	Scheelite	41.7	3200	5.5	240	677
2959	0.8Ba <sub>0.6</sub> Sr <sub>0.4</sub> La <sub>4</sub> Ti <sub>4</sub> O <sub>15</sub> -0.2Ba <sub>5</sub> Nb <sub>4</sub> O <sub>15</sub>	1475	Hexagonal Perovskite	41.7	25100		2	1274
2960	Zr(Zn <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>0.6</sub> Ti <sub>1.4</sub> O <sub>6</sub>		ZrTi <sub>2</sub> O <sub>6</sub> type Orthorhombic Pbcn	41.7	42100		-16	1275
2961	SmTiTaO <sub>6</sub>	1500	Aeschneite Orthorhombic	41.8	24500		24	583
2962	(Ni <sub>1/3</sub> Ta <sub>2/3</sub> ) <sub>1-x</sub> Ti <sub>x</sub> O <sub>2</sub> (x=0.3)	1300	Rutile Tetragonal P4 <sub>2</sub> /mmm	41.8	20600		35	1276
2963	BiNb <sub>1-x</sub> Mo <sub>x</sub> O <sub>4</sub> (x=0.01)	950	Orthorhombic Pnma	41.8	3500		-15	1277
2964	Pr <sub>0.2</sub> Gd <sub>0.8</sub> TiNbO <sub>6</sub>	1400	Orthorhombic Pnma	41.9	9500		35	564
2965	Ba(Nd <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1500/96h	Perovskite	41.9	15000	6.8	13	590
2966	Ba <sub>3-x</sub> Sr <sub>x</sub> LaNb <sub>3</sub> O <sub>12</sub> (x=0.5)	1390	Trigonal R-3m	41.9	19400		-65	1125
2967	0.67CaTiO <sub>3</sub> -0.33NdAlO <sub>3</sub>	1450/10h	Perovskite Orthorhombic	42.0	42900		45	1174
2968	ZrTiO <sub>4</sub>	1400	Orthorhombic Pbcn	42.0	31000	7	58	1188
2969	Ca <sub>4.38</sub> Ni <sub>0.62</sub> Nb <sub>2</sub> TiO <sub>12</sub>	1550	Perovskite Orthorhombic Pnma	42.0	28200	4	≈0	230
2970	Sr <sub>4</sub> Ti <sub>3</sub> O <sub>10</sub>	1300/5h	Tetragonal I4/mmm	42.0	960	4		53
2971	0.95Ba(Zn <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub> -0.05BaZrO <sub>3</sub>	1450/2h	Perovskite Perovskite Cubic Pm3m	42.0	96000	7	27	1278
2972	0.84Ba <sub>5</sub> Nb <sub>4</sub> O <sub>15</sub> -0.16BaNb <sub>2</sub> O <sub>6</sub> +0.3 wt% B <sub>2</sub> O <sub>3</sub>	900	Composite	42.0	28000		0	835
2973	Ba <sub>x</sub> La <sub>4</sub> Ti <sub>3+x</sub> O <sub>12+3x</sub> (x=0.2)	—		42.0	86000		-17	1279
2974	BaTi <sub>5</sub> O <sub>11</sub>	1120/24	Monoclinic P2 <sub>1</sub> /n	42.0	61100	—	40	1280
2975	La <sub>0.43</sub> Ca <sub>0.57</sub> [Ca <sub>0.08</sub> Mg <sub>0.14</sub> Ti <sub>0.78</sub> ]O <sub>3</sub>		Perovskite	42.0	18000	5.0	9	950
2976	La <sub>9</sub> Mg <sub>80.5</sub> Ti <sub>8.5</sub> O <sub>31</sub>		Perovskite slab series	42.0	15000	8.4	-11	950
2977	0.6CaTiO <sub>3</sub> -0.4SmGaO <sub>3</sub>	1450/12h	Perovskite, multiphase	42.0	35000		-11	1174
2978	(1-x)LaMg <sub>1/2</sub> Ti <sub>1/2</sub> O <sub>3</sub> -xLa <sub>2/3</sub> TiO <sub>3</sub> (x=0.45)		Perovskite	42.0	4500	4.8	-30	950
2979	BaNb <sub>2</sub> O <sub>6</sub> (hex)	1050	Hexagonal columbite	42.0	4000		-800	835, 995
2980	Ba <sub>0.79</sub> Sr <sub>0.21</sub> Ti <sub>5</sub> O <sub>11</sub> (hot pressed)	1050/72h	Monoclinic P2 <sub>1</sub> /n	42.0	39000	10	44	1260

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
2981	$\text{Ca}_{4.38}\text{Ni}_{0.62}\text{Nb}_2\text{TiO}_{12}$	1550	Perovskite	42.0	28200	4	0	230, 1112
2982	$\text{Sr}(\text{Sm}_{0.5}\text{Ta}_{0.5})\text{O}_3 + 0.5 \text{ wt\% Nb}_2\text{O}_5 + 3 \text{ wt\% TiO}_2$	1600/4h	Complex perovskite Tetragonal	42.0	8750		3	859
2983	$\text{Ca}_3\text{Sr}_2\text{Ta}_2\text{TiO}_{12}$	1600	Perovskite Orthorhombic Pnma	42.0	16000	3.5	14	1209
2984	$0.6\text{CaTiO}_3 - 0.4\text{Sm}(\text{Mg}_{0.5}\text{Ti}_{0.5})\text{O}_3$	1550	composite	42.0	9200	4.8	6	865
2985	$\text{Ba}_{0.8}\text{Sr}_{0.2}(\text{Zn}_{1/3}\text{Ta}_{2/3})_{0.94}\text{Ti}_{0.06}\text{O}_3$	1400	Perovskite	42.0	82000	10	-13	1192
2986	$\text{Ca}_{0.6}(\text{Li}_{.5}\text{Nd}_{.5})_{0.45}\text{Zn}_{.55}\text{TiO}_3 + 2 \text{ wt\% } 0.33\text{ZnO} - 0.67\text{H}_3\text{BO}_3$	900/4h	Multi phase	42.0	10300		19	1281
2987	$0.1\text{CaTiO}_3 - 0.9\text{Nd}(\text{Mg}_{1/2}\text{Ti}_{1/2})\text{O}_3$	1400	Perovskite Orthorhombic	42.0	35000		-10	1282
2988	$\text{Sr}(\text{Sm}_{1/2}\text{Ta}_{1/2})\text{O}_3 + 3 \text{ wt\% TiO}_2$	1600	Perovskite	42.0	8800		3	861
2989	$0.76\text{ZrTi}_2\text{O}_6 - 0.24\text{ZnNb}_2\text{O}_6$	1300/4h	Composite	42.0	22976			1283
2990	$\text{Nd}(\text{W}_{0.5}\text{Ti}_{1.5})\text{O}_6$	1350	Orthorhombic Pnma Aeschynite type	42.0	26200		9	1121
2991	$0.4\text{La}(\text{Mg}_{1/2}\text{Ti}_{1/2})\text{O}_3 - 0.6(\text{Na}_{0.5}\text{Nd}_{0.5})\text{TiO}_3 + 1 \text{ wt\% B}_2\text{O}_3$	1475	Composite	42.0	33000	8	1	1284
2992	$5.5\text{Li}_2\text{O} - \text{Nb}_2\text{O}_5 - 7.5\text{TiO}_2$	1075		42.0	16900	5.75	64	1253
2993	$\text{Ca}'\text{Zr}_x\text{Ti}_{1-x}\text{O}_3$ ( $x=0.9$ )	1515/15h	Perovskite Orthorhombic Pcmn	42.0	10700	4.6	82	916
2994	$0.36\text{Ca}_4\text{La}_2\text{Ti}_5\text{O}_{17} - 0.64\text{LaAlO}_3$	1560/4h	Composite	42.0	12500		0	1285
2995	$0.4\text{LaAlO}_3 - 0.6\text{SrTiO}_3$	1680	Perovskite	42.1	83000	9.5	8	832
2996	$\text{Ba}_5\text{Nb}_{4-x}(\text{W}_{1/2}\text{Ti}_{1/2})\text{O}_{15}$ ( $x=0.4$ )		Perovskite	42.2	38600		53	1286
2997	$\text{Ba}_4\text{LaTiTaO}_{15}$	1540/6h	Trigonal P-3m1	42.3	28790		33	1287
2998	$\text{Ca}(\text{La}_{0.5}\text{Nd}_{0.5})_4\text{Ti}_4\text{O}_{15}$ ( $\text{A}_n\text{B}_{n-1}\text{O}_{3n}$ )	1525	Hexagonal Perovskite	42.3	15200	8.3	-6	1288
2999	$\text{Ba}_{11}\text{TiNb}_8\text{O}_{33}$	1400		42.3	27000		47	1289, 1290
3000	$\text{CaLa}_{0.5}\text{Nd}_{0.5}\text{Ti}_4\text{O}_{15}$	1525	Hexagonal Perovskite	42.3	15200	8.3	-6	1288
3001	$\text{Ba}_4\text{LaTiTa}_3\text{O}_{15}$	1540/6h	Perovskite Hexagonal	42.3	28800		33	1291
3002	$\text{Sr}_{0.92}[\text{Li}_{1/4}\text{Nb}_{3/4}]_{0.92}\text{Ti}_{0.08}\text{O}_3$	1350/2h	Perovskite	42.3	31500	9	-	1197
3003	$\text{ZnO} - \text{Nb}_2\text{O}_5 - \text{TiO}_2 - \text{SnO}_2 + 1.5 \text{ wt\% CuO} - \text{V}_2\text{O}_5$	860	Mixture phases	42.3	9000		8	1292

3004	Ba <sub>1-x</sub> La <sub>x</sub> [Zn <sub>(1+x)/3</sub> Nb <sub>(2-x)/3</sub> ]O <sub>3</sub> (x=0.05)	1350/4h	Perovskite	42.4	46530		35	1226
3005	BaLa <sub>3</sub> Ti <sub>2</sub> NbO <sub>12</sub>	1460/6h	Hexagonal perovskite	42.4	33600		6	1293
3006	Zr <sub>0.7</sub> (Zn <sub>1/3</sub> Ta <sub>2/3</sub> ) <sub>0.3</sub> TiO <sub>4</sub>	1300	Orthorhombic $\alpha$ -PbO <sub>2</sub>	42.5	40200	5	1	1294
3007	0.3BaTiO <sub>3</sub> -0.7La(Mg <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub>		Perovskite I4/mcm	42.5	14225	7.23	-34	933
3008	5.5Li <sub>2</sub> O-Nb <sub>2</sub> O <sub>5</sub> -7.5TiO <sub>2</sub>	1100		42.6	16800		66	1253
3009	SrLaSm <sub>3</sub> Ti <sub>5</sub> O <sub>17</sub>	1350		42.6	7300		-96	1295
3010	Ba <sub>2</sub> La <sub>2</sub> TiNb <sub>2</sub> O <sub>12</sub>	1440		42.7	31130		-4	1296
3011	Ba <sub>21</sub> Nb <sub>16</sub> TiO <sub>63</sub>			42.7	19000		25	1289
3012	Ba <sub>2</sub> La <sub>3</sub> Ti <sub>3</sub> NbO <sub>15</sub> (A <sub>5</sub> B <sub>4</sub> O <sub>15</sub> )	1460	Hexagonal perovskite	42.8	21700	5.85	-8	1297
3013	Ba <sub>16</sub> Nb <sub>12</sub> TiO <sub>48</sub>		Not available	42.9	29000		25	1289
3014	Ba <sub>0.9</sub> Ca <sub>0.1</sub> (Y <sub>0.315</sub> Nb <sub>1/2</sub> )O <sub>3+<math>\delta</math></sub>		Perovskite	42.9	63500	7.78	235	1202
3015	Ba <sub>6</sub> Ti <sub>1-x</sub> Sn <sub>x</sub> Nb <sub>4</sub> O <sub>18</sub> (x=0)	1460	Trigonal R-3m	43.0	11530	5.6	64	982
3016	Bi <sub>12</sub> SiO <sub>20</sub>	800/5h	Cubic I23	43.0	86800		-10	1298
3017	Sr <sub>4</sub> LaTiNb <sub>3</sub> O <sub>15</sub>	1460	Hexagonal perovskite	43.0	44700	5.18	13	1299
3018	Li <sub>0.215</sub> Nb <sub>0.645</sub> Ti <sub>0.14</sub> O <sub>2</sub>	1020		43.0	14500		-15	1300
3019	Ba <sub>2-x</sub> Sr <sub>x</sub> La <sub>3</sub> Ti <sub>3</sub> NbO <sub>15</sub> (x=1)	1520		43.0	39100		1	1301
3020	Pb <sub>0.5</sub> Ca <sub>0.5</sub> (Cr <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>		Perovskite	43.0	3800	4.6	293	996
3021	BiNbO <sub>4</sub>	875	Orthorhombic Pnma	43.0	15700	4.3	38	1302, 1303
3022	0.7CaTiO <sub>3</sub> -0.3NdAlO <sub>3</sub>		Perovskite Orthorhombic	43.0	47000	-	0	1304, 1305
3023	Sr(Zn,Nb)O <sub>3</sub> -SrTiO <sub>3</sub>		Perovskite	43.0	25000	5	-5 to 5	1306
3024	La <sub>0.57</sub> Ca <sub>0.43</sub> [Ca <sub>0.11</sub> Mg <sub>0.18</sub> Ti <sub>0.71</sub> ]O <sub>3</sub>		Perovskite	43.0	26000	3.5	-19	950
3025	Ca <sub>4</sub> BaTa <sub>2</sub> TiO <sub>12</sub>	1575	Orthorhombic Pnma	43.0	5000	3.9	14	1307
3026	0.16BaNb <sub>2</sub> O <sub>6</sub> -0.84Ba <sub>5</sub> Nb <sub>4</sub> O <sub>15</sub> +0.3 wt% B <sub>2</sub> O <sub>3</sub> +0.3 wt% V <sub>2</sub> O <sub>5</sub>	900	Composite	43.0	19500		0	835
3027	Ca <sub>5</sub> NbTaTiO <sub>12</sub>	1580	Complex perovskite Orthorhombic Pnma	43.0	30000	-	28	1209, 1231
3028	Ba(Nd <sub>0.8</sub> Sm <sub>0.2</sub> ) <sub>2</sub> Ti <sub>4</sub> O <sub>12</sub> +1 wt% B <sub>2</sub> O <sub>3</sub>	1020	Tungsten Bronze	43.0	5500			1308
3029	Ca <sub>4.36</sub> Zn <sub>0.64</sub> Nb <sub>2</sub> TiO <sub>12</sub>	1550	Orthorhombic perovskite Pnma	43.0	29000	4.0	0	230
3030	Ba <sub>6</sub> Nb <sub>4</sub> TiO <sub>18</sub>	1625/2h	A <sub>6</sub> B <sub>5</sub> O <sub>18</sub> type perovskite	43.0	9500		53	895
3031	Sr <sub>6</sub> Nb <sub>4</sub> TiO <sub>18</sub>	1625/2h	A <sub>6</sub> B <sub>5</sub> O <sub>18</sub> type perovskite	43.0	6700		26	895

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No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
3032	$Zr_{0.7}(ZnTa)_{0.3}TiO_4$	1300/3h	Orthorhombic Pbcn	43.0	40200		1	1294
3033	$Ba(Sm_{1/2}Nb_{1/2})O_3$	1600	Perovskite Cubic Fm3m	43.0	18400		9	1136
3034	$Sm_{0.9}Y_{0.1}TiNbO_6$	1560	Aeschneite Orthorhombic	43.0	10230		47	564
3035	$0.52Nd(Co_{1/2}Ti_{1/2}O_3-0.48CaTiO_3)$	1550	Composite	43.0	4000		0	1309
3036	$Ba_xLa_4Ti_{3+x}O_{12+3x}$ (x=2.3)			43.0	23480		-17	1310
3037	$La_2Ti_2O_7$		Monoclinic P2 <sub>1</sub>	43.0	2200	5.5	-6	950
3038	$0.7CaTiO_3-0.3La(Ga_{0.5}Al_{0.5})O_3$	1540	Composite	43.0	40000		13	1269
3039	$BiNbO_4+0.4$ wt% $V_2O_5+0.1$ wt% CuO	900	Orthorhombic Pnma Stibiotantalite	43.0	20400		8	1311
3040	$0.5La(Mg_{1/2}Ti_{1/2})O_3-0.5CaTiO_3$	1600	Composite	43.0	28000	5.5	-13	1312
3041	$Ca_{4.5}Mg_{0.5}Nb_4TiO_{17}$	1250		43.0	17850		-33	877
3042	$NdTiTaO_6$	1550	Aeschneite Orthorhombic	43.1	26400		30	583
3043	$Ca[(Li_{1/3}Nb_{2/3})_{0.7}Ti_{0.3}]O_{3-d}+6$ wt% $Bi_2O_3$ , 2 wt% $B_2O_3$	920	Perovskite	43.1	10600	7.68	10	1235
3044	$Ca[(Li_{1/3}Nb_{2/3})_{0.7}Ti_{0.3}]O_{3-d}+3$ wt% $Bi_2O_3$ , 2 wt% $B_2O_3$	940	Perovskite	43.1	12900	7.73	54	1235
3045	$Zr_{0.752}Hf_{0.248}TiO_4$		Orthorhombic Pbcn	43.2	20000	8.5	-	1088
3046	Alpha- $Bi_3SbO_7$	890	Anorthic	43.2	2080		0	1181
3047	$BiNbO_4+0.5$ wt% CuO	900	Orthorhombic Pnma Stibiotantalite	43.3	13000	6.3	15	1313
3048	$Ca[La_{0.875}Nd_{0.125}]_4Ti_4O_{15}$ ( $A_nB_{n-1}O_{3n}$ )	1550	Hexagonal perovskite	43.4	32900	7.52	-13	1288
3049	$(1-x)Ca(Mg_{1/3}Ta_{2/3})O_3-x(Ca_{0.8}Sr_{0.2})TiO_3$ (x=0.4)	1425/2h	Composite	43.4	46000	6.8	-3	1314
3050	$Ba_3LaNb_3O_{12}$	1500	Hexagonal perovskite R-3m	43.5	9000		-100	1315, 1316
3051	$Sr_5Ta_4O_{15}$	1510	Hexagonal perovskite	43.5	2400		-	1090
3052	$0.7CaTiO_3-0.3NdAlO_3$		Perovskite	43.5	30000	8	-2	1269
3053	$Ba_{11}Nb_8TiO_{33}$			43.5	12000		33	1289
3054	$BiTaO_4$	950	Triclinic	43.5	12000		-40	1317
3055	$Bi_{0.99}(La_{0.38}Nd_{0.62})_{0.01}NbO_4$	820	Orthorhombic+Triclinic	43.5	12300		13	1318
3056	$0.66CaTiO_3-0.34(La_{0.5}Nd_{0.5})GaO_3$		Perovskite Rhombic	43.6	43000	8	-10	1269

3057	$\text{CaLa}_4\text{Ti}_4\text{O}_{15}$ ( $\text{A}_n\text{B}_{n-1}\text{O}_{3n}$ )	1550	Hexagonal perovskite	43.6	33850	7.8	-17	1288
3058	$0.7\text{CaTiO}_3\text{-}0.3\text{NdAlO}_3$	1450/10h	Rhombic perovskite	43.7	34800		14	1174
3059	$\text{Ba}(\text{Ti}_{0.85}\text{Mn}_{0.15})\text{O}_3 + 15 \text{ wt\% Li}_2\text{CO}_3$	950	Perovskite	43.7	2500		-30	1319
3060	$(\text{Sr}_{0.2}\text{Ca}_{0.488}\text{Nd}_{0.2}\text{O}_8)\text{Ti}_{1-x}\text{Ga}_{4x/3}\text{O}_3$ ( $x=0.5$ )	1350/4h	Orthorhombic Perovskite Pnma	43.7	60000	4.7	8	1320
3061	$0.7\text{Ca}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3\text{-}0.3(\text{Ca}_{0.8}\text{Sr}_{0.2})\text{TiO}_3$		Perovskite	43.8	45200	7.2	-4	1321
3062	$\text{Zn}_{0.17}\text{Nb}_{0.33}\text{Ti}_{0.5}\text{O}_2$	1080	—	43.8	35000	9		1322
3063	$\text{SrLa}_4\text{Ti}_4\text{O}_{15}$ ( $\text{A}_n\text{B}_{n-1}\text{O}_{3n}$ )		Hexagonal perovskite P-3m	43.8	50200	4.15	-14	1262, 1272
3064	$\text{Ba}_{1-x}\text{La}_x[\text{Zn}_{(1+x)/3}\text{Nb}_{(2-x)/3}]\text{O}_3$ ( $x=0.35$ )	1350/4h	Perovskite	43.8	2180		-10	1226
3065	$\text{Bi}_{0.992}\text{Gd}_{0.008}\text{NbO}_4$	900/3h	Orthorhombic Pnma	43.8	16850	4.3	0	1323
3066	$\text{Ca}[(\text{Li}_{1/3}\text{Nb}_{2/3})_{0.7}\text{Ti}_{0.3}]\text{O}_{3-\delta} + 1 \text{ wt\% Bi}_2\text{O}_3 + 1 \text{ wt\% B}_2\text{O}_3$	960	Perovskite	43.9	16600	7.6	35	1235
3067	$\text{Ca}_4\text{MgNb}_2\text{TiO}_{12}\text{-}x\text{CaTiO}_3$ ( $x=0.3$ )		Composite	43.9	20200		-7	1324
3068	$0.66\text{Ca}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3\text{-}0.34\text{CaTiO}_3 + 0.25 \text{ wt\% B}_2\text{O}_3$	1250	Composite	44.0	30000	6.7	-2	1325
3069	$0.1\text{CaTiO}_3\text{-}0.9\text{Nd}(\text{Mg}_{1/2}\text{Ti}_{1/2})\text{O}_3 + 0.5 \text{ wt\% ZnO}$	1325	Composite	44.0	43800		1	1326
3070	$0.32\text{Nd}(\text{Zn}_{0.45}\text{Mg}_{0.05}\text{Ti}_{0.5})\text{O}_3\text{-}0.1\text{NdAlO}_3\text{-}0.58\text{CaTiO}_3$		Composite	44.0	32200	1.97	0	1327
3071	$\text{Bi}_2\text{Ti}_3\text{TeO}_{12}$	900/10h		44.0	12500		146	1131
3072	$\text{ZrTiO}_4\text{-ZnNb}_2\text{O}_6$		Composite	44.0	48000		0	1283
3073	$\text{Ca}_2\text{Sr}_3\text{Ta}_2\text{TiO}_{12}$	1575	Perovskite Orthorhombic Pnma	44.0	8500	3.5	18	1209
3074	$\text{BaTiNb}_4\text{O}_{13}$	1250	Orthorhombic Pbma	44.0	9000	4.7	15	1208
3075	$\text{Sr}_2\text{Zn}_4\text{Ti}_{15}\text{O}_{36}$	1150/8h	Trigonal R-3m	44.0	3600	10	160	1026
3076	$\text{Ba}_8\text{Ta}_{4+0.8x}\text{Ti}_{3-x}\text{O}_{24}$ ( $x=0.8$ )	1400/40h		44.0	9720			920
3077	$\text{Ba}(\text{Nd}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1600	Complex perovskite	44.0	11700		10	1136
3078	$\text{Ca}_{0.7}\text{Nd}_{0.3}\text{Ti}_{0.7}\text{Al}_{0.3}\text{O}_3$		Perovskite Orthorhombic	44.0	40000		0	1328
3079	$\text{Ba}(\text{La}_{0.99}\text{Al}_{0.11})_4\text{Ti}_4\text{O}_{15}$ ( $\text{A}_n\text{B}_{n-1}\text{O}_{3n}$ )		Hexagonal perovskite	44.0	47000		1	1329
3080	$0.66\text{CaTiO}_3\text{-}0.34\text{LaAlO}_3$	1450/12h	Perovskite Orthorhombic	44.0	30000		-3	1174
3081	$\text{Ba}_{0.9}\text{Ca}_{0.1}(\text{Y}_{0.33}\text{Nb}_{1/2})\text{O}_{3+\delta}$		Complex perovskite	44.0	41210	7.7	234	1202
3082	$0.7\text{Ca}(\text{Li}_{1/4}\text{Nb}_{3/4})\text{O}_3\text{-}0.3\text{CaTiO}_3$	1250	Composite	44.0	12000		-9	1330

(continued)



No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
3083	$\text{Sr}_2\text{La}_4\text{Ti}_5\text{O}_{18}+0.3 \text{ wt\% Bi}_2\text{O}_3\text{-B}_2\text{O}_3$	1625/2h		44.0	23000		22	895
3084	$0.6\text{CaTiO}_3\text{-}0.4\text{NdGaO}_3$	1450/12h	Perovskite	44.0	30000		-18	1174
3085	$\text{BiNbO}_4+0.5 \text{ wt\% V}_2\text{O}_5$	895	Orthorhombic Pnma	44.0	15800	7	18	1311
3086	$\text{BiNbO}_4+0.25 \text{ wt\% CuO+V}_2\text{O}_5$	900	Orthorhombic Pnma	44.0	18660		-8	1311
3087	$\text{Bi}_{0.95}\text{Sm}_{0.05}\text{NbO}_4+0.5 \text{ wt\% CuO}$	900	Orthorhombic Pnma	44.0	12900		-4	1331
3088	$\text{BiNb}_{0.4}\text{Ta}_{0.6}\text{O}_4$	940	Orthorhombic Pnma	44.0	21000		-30	1332
3089	$0.5\text{La}(\text{Mg}_{1/2}\text{Ti}_{1/2})\text{O}_3\text{-}0.5\text{CaTiO}_3+1 \text{ wt\% B}_2\text{O}_3$	1400	Perovskite	44.0	28000	7	-8	1312
3090	$0.225\text{Li}_2\text{O-}0.67\text{Nb}_2\text{O}_5\text{-}0.1\text{TiO}_2$	1350		44.0	28000		-20	760
3091	$\text{Na}_{1-x}\text{K}_x\text{Ca}_4\text{Nb}_5\text{O}_{17} \text{ (x=0)}$	1200	Monoclinic P21/a $\text{A}_n\text{B}_n\text{O}_{3n+2}$	44.0	13800		-120	1333
3092	$\text{Ba}_8\text{Nb}_4\text{Ti}_3\text{O}_{24}$	1450	Hexagonal $\text{P6}_3/\text{mmc}$	44.1	22000		115	1334
3093	$0.66\text{CaTiO}_3\text{-}0.34(\text{La}_{0.5}\text{Nd}_{0.5})\text{GaO}_3$		Rhombic perovskite	44.1	43000	8	1	1269
3094	$\text{Ba}_2\text{La}_2\text{TiNb}_2\text{O}_{12}$	1350/6h	Hexagonal perovskite	44.2	31660	6.9	-5	1316
3095	$\text{Ca}[\text{Ti}_{1-x}(\text{Mg}_{1/3}\text{Nb}_{2/3})_x]\text{O}_3 \text{ (x=0.65)}$	1450/4h	Perovskite	44.2	28340		-2	1335
3096	$\text{CaLa}_4\text{Ti}_4\text{O}_{15}+1 \text{ wt\% BiVO}_4$	1425		44.3	51400		-9	1336
3097	$\text{BaLa}_4\text{Ti}_4\text{O}_{15}(\text{A}_n\text{B}_{n-1}\text{O}_{3n})$	1600/2h	Hexagonal perovskite P-3c1	44.4	41000		-26	1262, 1329 ,1337
3098	$\text{Bi}_{0.95}\text{Sm}_{0.05}\text{NbO}_4$	950	Orthorhombic Pnma	44.4	13000	7.2	-4	1338
3099	$(\text{Li}_{0.5}\text{Bi}_{0.5})\text{MoO}_4$	560	Scheelite	44.4	3200	5.5	245	30
3100	$\text{Ca}_4\text{La}_2\text{Ti}_{5-x}(\text{Mg}_{1/3}\text{Nb}_{2/3})_x\text{O}_{17} \text{ (x=2.5)}$	1540	Orthorhombic Pbnm	44.4	16400		15	1118
3101	$0.67\text{ZrTi}_2\text{O}_6\text{-}0.33\text{ZnNb}_2\text{O}_6+0.7 \text{ wt\% MnCO}_3$	1270	Composite	44.4	44800		-7	1339
3102	$0.5\text{Nd}(\text{Co}_{1/2}\text{Ti}_{1/2})\text{O}_3\text{-}0.5(\text{Ca}_{0.8}\text{Sr}_{0.2})\text{TiO}_3$	1340/4h	Composite	44.5	20000		0	1340
3103	$\text{BiNb}_{0.95}\text{Sb}_{0.05}\text{O}_4$	880	Orthorhombic Pnma	44.5	14300		-5	1251
3104	$\text{BiNb}_{0.88}\text{Ta}_{0.12}\text{O}_4+0.5 \text{ wt\% CuO}$	920	Orthorhombic Pnma	44.5	14000		-0	1313
3105	$\text{Ba}(\text{Pr}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1600	Complex perovskite	44.5	28500		-22	1136
3106	$\text{Ba}(\text{Y}_{0.3}\text{Bi}_{0.2}\text{Nb}_{0.5})\text{O}_3$	1300	Complex perovskite	44.6	2000		6	1341
3107	$\text{Ba}_4\text{Nd}_2\text{Ti}_3\text{Nb}_2\text{O}_{18}$	1450/8h		44.6	13100		18	1342
3108	$\text{Ba}_{1-x}\text{La}_x[\text{Zn}_{(1+x)/3}\text{Nb}_{(2-x)/3}]\text{O}_3 \text{ (x=0.3)}$	1350/4h	Perovskite	44.7	1990		7.7	1226

3109	$\text{Ca}_2\text{La}_4\text{Ti}_5\text{O}_{18}$		$\text{A}_n\text{B}_{n-1}\text{O}_{3n}$ Trigonal perovskite R-3m	44.7	20100	4.19	6	1272
3110	$\text{Ca}_2\text{Zn}_4\text{Ti}_{15}\text{O}_{36}+4 \text{ wt}\% \text{ CaO-B}_2\text{O}_3\text{-SiO}_2$	1050/2h	Trigonal R-3	44.7	31000			1343
3111	$0.67\text{CaTiO}_3\text{-}0.33(\text{La}_{0.5}\text{Nd}_{0.5})\text{GaO}_3$		Rhombic perovskite	44.7	41000	8	6.3	1269
3112	$\text{Ca}[(\text{Li}_{1/3}\text{Nb}_{2/3})_{1-x}\text{Ti}_x]\text{O}_3$ ( $x=0.3$ )	1150/3h	Perovskite	44.7	22500		20	752
3113	$\text{Ba}_6\text{Nb}_4\text{TiO}_{18}$	1450	Trigonal R-3m	44.9	12000		33	895
3114	$\text{Sr}(\text{Fe}_{1/2}\text{Nb}_{1/2})\text{O}_3+0.2 \text{ wt}\% \text{ B}_2\text{O}_3$	1350/4h	Complex perovskite Cubic Pm3m	44.9	10600		-15	823
3115	$\text{Sr}(\text{Fe}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1600/4h	Complex perovskite Cubic Pm3m	44.9	4800		-24	823
3116	$0.7\text{La}_{2/3}\text{TiO}_3\text{-}0.3\text{LaAlO}_3$	1400/33h	Perovskite Orthorhombic	44.9	33000	6	7	1096
3117	$\text{Ca}_5\text{Nb}_4\text{TiO}_{17}$	1475	Monoclinic P2 <sub>1</sub> /c	44.9	17600		-113	877, 1245
3118	$\text{BiNbO}_4+0.03 \text{ wt}\% \text{ CuV}_2\text{O}_6$ (Ortho)	1000	Orthorhombic Pnma	44.9	16100		-3	1104
3119	$0.55\text{Ca}(\text{Mg}_{1/3}\text{Ta}_{2/3})\text{O}_3\text{-}0.45\text{Ca}_{0.8}\text{Sm}_{0.4/3}\text{TiO}_3$	1450	Composite	45.0	41700	6.6	0	1344
3120	$\text{Ba}_{2/3}\text{La}_{1/3}\text{Zn}_{1/3}\text{Ti}_{1/3}\text{Nb}_{1/3}\text{O}_3$	1400		45.0	6500	6.09	-6	919
3121	$\text{NiNb}_2\text{O}_6+30 \text{ wt}\% \text{ TiO}_2$	1300/2h	Orthorhombic Pbcn	45.0	7700	6	73	1345
3122	$0.73\text{CaTiO}_3\text{-}0.27\text{NdAlO}_3$	1450/10h	Rhombic perovskite	45.0	31000		-15	1174
3123	$\text{Ca}[(\text{Li}_{1/3}\text{Ta}_{2/3})_{1.5}\text{Ti}_{0.5}]\text{O}_{3-\delta}+3 \text{ wt}\% \text{ B}_2\text{O}_3$	1050	Perovskite	45.0	12300	8	75	765
3124	$\text{Na}_{1-x}\text{K}_x\text{Ca}_4\text{Nb}_5\text{O}_{17}$ ( $x=0.25$ )	1300	Monoclinic P2 <sub>1</sub> /a $\text{A}_n\text{B}_n\text{O}_{3n+2}$	45.0	4600		34	1333
3125	$0.81\text{BiVO}_4\text{-}0.19\text{YVO}_4$	870/2h	Monoclinic+Tetragonal	45.0	14000		10	1346
3126	$\text{Na}_{1-x}\text{K}_x\text{Ca}_4\text{Nb}_5\text{O}_{17}$ ( $x=0.75$ )	1300	Monoclinic P2 <sub>1</sub> /a $\text{A}_n\text{B}_n\text{O}_{3n+2}$	45.0	3700		123	1333
3127	$0.58\text{ZnNb}_2\text{O}_6\text{-}0.42\text{TiO}_2$	1250/2h	Composite	45.0	6000		0	1092
3128	$0.42\text{ZnNb}_2\text{O}_6\text{-}0.58\text{TiO}_2$	1250	Composite	45.0	48000	8	0	1092
3129	$0.45\text{Nd}_3\text{Ga}_5\text{O}_{12}\text{-}0.65\text{CaTiO}_3$	1450	Composite	45.0	46000	5	-2	340
3130	$0.7\text{CaTiO}_3\text{-}0.3\text{SmAlO}_3$	1450/12h	Perovskite Orthorhombic Pbnm	45.0	42000		1	1174
3131	$0.7\text{CaTiO}_3\text{-}0.3\text{NdAlO}_3$	1450/10h	Perovskite Orthorhombic Pbnm	45.0	44000		3	1174
3132	$\text{Ba}(\text{La}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1600	Complex perovskite Monoclinic	45.0	5700		7	1136
3133	$\text{BaLa}_4\text{Ti}_4\text{O}_{15}(\text{A}_n\text{B}_{n-1}\text{O}_{3n})$		Trigonal perovskite P-3m1	45.0	48000			1329
3134	$\text{Sr}(\text{Fe}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1450/4h	Perovskite Cubic Pm3m	45.0	4800		-24	1163
3135	$\text{CaSr}_4\text{Ta}_2\text{TiO}_{12}$	1550	Perovskite Orthorhombic Pnma	45.0	15500	3.4220	21	1209

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No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
3136	Ba <sub>x</sub> La <sub>4</sub> Ti <sub>3+x</sub> O <sub>12+3x</sub> (x=0.4)	–	Trgonal perovskite P-3m1	45.0	60000		–15	1279
3137	Ba <sub>x</sub> La <sub>4</sub> Ti <sub>3+x</sub> O <sub>12+3x</sub> (x=0.6)	–	Trigonal perovskite P-3m1	45.0	50000		–13	1279
3138	BaTiTa <sub>2</sub> Nb <sub>2</sub> O <sub>13</sub>	1350	Orthorhombic Pbma	45.0	3500	5.2	96	1208
3139	BaSr <sub>4</sub> Nb <sub>4</sub> O <sub>15</sub> (A <sub>n</sub> B <sub>n-1</sub> O <sub>3n</sub> )	1400	Trigonal Perovskite P-3m1	45.0	23300	4.57	82	325
3140	0.2CaTiO <sub>3</sub> -0.8Sr(Mg <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub>	1600	Perovskite	45.0	9000		0	1347
3141	Ba <sub>2</sub> La <sub>3</sub> Ti <sub>3</sub> TaO <sub>15</sub>	1520		45.0	26800		1	1348
3142	0.6CaTiO <sub>3</sub> -0.4LaGaO <sub>3</sub>	1450/12h	Perovskite	45.0	34000		–20	1174
3143	0.65CaTiO <sub>3</sub> -0.35SmGaO <sub>3</sub>	1450/12h	Perovskite	45.0	34000		1	1174
3144	SmTiNbO <sub>6</sub>	1400	Euxenite Orthorhombic Pnma	45.0	18000	4.89	50	563
3145	0.7CaTiO <sub>3</sub> -0.3NdAlO <sub>3</sub>	1450/10h	Perovskite Orthorhombic	45.0	44000		0	1349
3146	0.65CaTiO <sub>3</sub> -0.35NdGaO <sub>3</sub>	1450	Perovskite Orthorhombic	45.0	46000		–2	1349
3147	Ca[(Li <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>1-x</sub> Ti <sub>x</sub> ]O <sub>3-δ</sub> (x=0.3)	1150/3h	Perovskite	45.0	22500		20	752
3148	La <sub>2/3</sub> TiO <sub>3</sub> ·LaAlO <sub>3</sub>			45.0	33000		7	1096
3149	0.48La(Co <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> -0.52CaTiO <sub>3</sub>	1550	P2 <sub>1</sub> /n Monoclinic perovskite	45.0	5000	7.8	0	1309
3150	0.5Nd(Zn <sub>1.2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> -0.5CaTiO <sub>3</sub>	1300/4h	P2 <sub>1</sub> /n Monoclinic perovskite	45.0	56000		0	1350
3151	Ba(Mn <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub>	1450/2h	Perovskite Hexagonal	45.0	11600	5.75	–4	1351
3152	Ba <sub>3</sub> La <sub>2</sub> Ti <sub>2</sub> Ta <sub>2</sub> O <sub>15</sub>	1540	Trigonal P-3m1	45.1	31000		–13	1353
3153	0.71CaTiO <sub>3</sub> -0.29NdAlO <sub>3</sub>	1450/10h	Perovskite Orthorhombic	45.1	38450		6	1174
3154	(1-x)Ca(Mg <sub>1/3</sub> Ta <sub>2/3</sub> )O <sub>3</sub> -xCaTiO <sub>3</sub> (x=0.45)	1550	Perovskite Orthorhmbic Pbnm	45.1	34800		17	1354
3155	0.7CaTiO <sub>3</sub> -0.3LaGa <sub>0.5</sub> Al <sub>0.5</sub> O <sub>3</sub>		Rhombic perovskite	45.2	40000	8	13	1306
3156	0.7CaTiO <sub>3</sub> -0.3(La <sub>0.5</sub> Nd <sub>0.5</sub> )(Ga <sub>0.5</sub> Al <sub>0.5</sub> )O <sub>3</sub>		Rhombic perovskite	45.2	43000	8	9	1269
3157	0.7CaTiO <sub>3</sub> -0.3Nd(Ga <sub>0.5</sub> Al <sub>0.5</sub> )O <sub>3</sub>		Rhombic perovskite	45.3	38000	8	11	1269
3158	Ba <sub>8</sub> Nb <sub>4</sub> Ti <sub>3</sub> O <sub>24</sub>	1400	Hexagonal P6 <sub>3</sub> /mmc	45.3	23500	5.6	115	1334
3159	Ba <sub>4</sub> LaNbTa <sub>2</sub> O <sub>15</sub>		Hexagonal perovskite	45.3	25100		52	1355
3160	Ba <sub>1-x</sub> Sr <sub>x</sub> La <sub>4</sub> Ti <sub>4</sub> O <sub>15</sub> (x=0.6)	1550	Trigonal P-3m1	45.4	47500		–1	1356
3161	0.6La(Mg <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> -0.4Ca <sub>0.6</sub> La <sub>0.8/3</sub> TiO <sub>3</sub> +w wt% CuO	1450	Composite	45.5	44600	8	2	1357
3162	Ba <sub>0.2</sub> Ca <sub>0.8</sub> (Fe <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>		Perovskite Orthorhombic Pbnm	45.5	2300	7.4	–34	1163
3163	(Ba <sub>1-x</sub> Sr <sub>x</sub> )La <sub>4</sub> Ti <sub>4</sub> O <sub>15</sub> (x=0.4)	1450/4h	Trigonal P-3m1	45.7	44200		–6	1356
3164	PrTiTaO <sub>6</sub>	1500	Aeschneite Orthorhombic	45.8	32300		33	583
3165	Pr <sub>0.5</sub> Gd <sub>0.5</sub> TiNbO <sub>6</sub>	1400		45.9	9500		41	564

3166	$\text{Zr}_{0.992}\text{Hf}_{0.008}\text{TiO}_4$		Orthorhombic Pbcn	45.9	13000	8.5	53	1088
3167	$\text{Pb}_{0.25}\text{Ca}_{0.75}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$		Perovskite	46.0	8700	3.7	-34	996
3168	$\text{BaLa}_4\text{Ti}_4\text{O}_{15}$		Hexagonal perovskite P-3m1	46.0	47000		-11	1329, 1337
3169	$\text{Ca}_3\text{Ti}_2\text{O}_7$		Orthorhombic Ccm2 <sub>1</sub>	46.0	2600	2.69	50	1358
3170	$0.1\text{La}_2\text{Ti}_2\text{O}_7-0.9\text{La}_4\text{Ti}_9\text{O}_{24}$	1300	Composite	46.0	5500		0	1137, 1138
3171	$\text{BaTiTa}_4\text{O}_{13}$	1450		46.0	6000	4.6	145	1208
3172	$\text{La}_{0.39}\text{Ca}_{0.61}[\text{Ca}_{0.11}\text{Mg}_{0.08}\text{Ti}_{0.81}]\text{O}_3$		Perovskite	46.0	17000	4.7	36	950
3173	$\text{Ba}_2\text{La}_4\text{Ti}_5\text{O}_{18}$	1575/10h	$\text{A}_n\text{B}_{n-1}\text{O}_{3n}$ perovskite Trigonal R-3m	46.0	31850		-36	1234
3174	$\text{Ca}_5\text{Nb}_{1.5}\text{Ta}_{0.5}\text{TiO}_{12}$	1560	Complex perovskite Orthorhombic Pnma	46.0	28400		35	1231
3175	$\text{CeTiTaO}_6$	1540	Aeschneite orthorhombic	46.0	33300		41	583
3176	$0.3\text{SrTiO}_3-0.7\text{Ca}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$	1475/3h	Perovskite	46.0	29300	6.8	2	1359
3177	$\text{Ca}_{0.7}\text{Ti}_{0.7}\text{La}_{0.3}\text{O}_3+0.25\text{ wt}\% \text{Al}_2\text{O}_3$	1500	Perovskite Orthorhombic	46.0	38200	4	12	1360
3178	$7\text{Bi}_2\text{O}_3\cdot 2\text{TeO}_2$ (oxygen atm)	750/15h	—	46.0	1100		-144	1068
3179	$\text{Ca}_2\text{Zn}_4\text{Ti}_{15}\text{O}_{36}+5\text{ wt}\% \text{V}_2\text{O}_5$	930	Trigonal R-3	46.0	13400		164	1361
3180	$\text{La}_3\text{Ti}_2\text{TaO}_{11}$	1560		46.0	7500		-47	1362
3181	$\text{CaLa}_4(\text{Zr}_{0.05}\text{Ti}_{0.95})_4\text{O}_{15}$	1550	Hexagonal	46.0	47500		-10	1363
3182	$\text{Bi}_{0.95}\text{Ce}_{0.05}\text{NbO}_{4.025}$	950	Triclinic+Orthorhombic	46.1	15000			1364
3183	$(\text{Ba}_{1-x}\text{Sr}_x)\text{La}_4\text{Ti}_4\text{O}_{15}$ (x=0.8)	1600	$\text{A}_n\text{B}_{n-1}\text{O}_{3n}$ Trigonal P-3m1	46.1	52800		-3	1356
3184	$\text{Ba}(\text{Er}_{0.3}\text{Bi}_{0.2}\text{Nb}_{0.5})\text{O}_3$	1300	Perovskite	46.1	1500		-27	1341
3185	$0.65\text{LiNb}_3\text{O}_8-0.35\text{TiO}_2$	11002h	Composite	46.2	5800		0	788
3186	$\text{Sr}_6\text{Nb}_4\text{TiO}_{18}$	1625/2h	Not available	46.2	6700		26	895
3187	$0.4\text{ZnNb}_2\text{O}_6-0.6\text{TiO}_2$	1125	Columbite+rutile	46.2	48000		-1	1365
3188	$0.5\text{ZnTa}_2\text{O}_6-0.5\text{TiO}_2$		Composite	46.2	36700		74	1366
3189	$0.55\text{La}(\text{Mg}_{1/2}\text{Ti}_{1/2})\text{O}_3-0.45\text{SrTiO}_3$	1475/4h	Composite	46.3	34000	8	0	1367
3190	$\text{Ba}_{2-x}\text{Sr}_x\text{La}_3\text{Ti}_3\text{NbO}_{15}$ (x=0.5)	1500	$\text{A}_n\text{B}_{n-1}\text{O}_{3n}$ Trigonal P-3m1	46.3	33600		4	1301, 1297
3191	$\text{BaLa}_4\text{Ti}_4\text{O}_{15}$	1450	$\text{A}_n\text{B}_{n-1}\text{O}_{3n}$ Trigonal perovskite P-3m1	46.3	16200	5.15	-13	1272

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
3192	Ba <sub>0.2</sub> Sr <sub>0.8</sub> La <sub>4</sub> Ti <sub>4.2</sub> O <sub>15</sub>	1450/5h	Perovskite Trigonal	46.4	36100		-3	1368
3193	0.64CaTiO <sub>3</sub> -0.36LaGaO <sub>3</sub>		Rhombic perovskite	46.5	48000	8	-3	1269
3194	Bi <sub>0.95</sub> Ce <sub>0.05</sub> NbO <sub>4</sub> +0.4 mol% CuO	950	Orthorhombic Pnma	46.5	3000			1369
3195	Ba <sub>3</sub> La <sub>2</sub> Ti <sub>2</sub> Nb <sub>2-x</sub> Ta <sub>x</sub> O <sub>15</sub> (x=1)	1500	Trigonal P-3m1	46.5	27140	-	-4	1353
3196	CaTi <sub>0.54</sub> (Al <sub>1/2</sub> Ta <sub>1/2</sub> ) <sub>0.46</sub> O <sub>3</sub>	1500/15h	Perovskite Orthorhombic	46.5	27300	8	0	1266
3197	Ca <sub>5</sub> Nb <sub>2</sub> TiO <sub>12</sub> +1 wt% NiO	1550/4h	Complex perovskite Orthorhombic Pnma	46.5	29000		34	1155
3198	Ca <sub>5</sub> Nb <sub>2</sub> TiO <sub>12</sub> +1 wt% Co <sub>3</sub> O <sub>4</sub>	1550/4h	Complex perovskite Orthorhombic Pnma	46.5	29000		32	1155
3199	(1-x)La(Mg <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> -xLa <sub>2/3</sub> TiO <sub>3</sub> (x=0.49)		Perovskite 12/a	46.5	8300	6.2		889
3200	Sr(Ga <sub>0.5</sub> Nb <sub>0.5</sub> ) <sub>1-x</sub> Ti <sub>x</sub> O <sub>3</sub> (x=0.3)	1575	Cubic perovskite Fm3m	46.6	42200		5	1370
3201	Ba <sub>3</sub> Nd <sub>2</sub> Ti <sub>2</sub> Nb <sub>2</sub> O <sub>15</sub>	1450/3h	Hexagonal perovskite	46.8	19500	5.1	28	1352
3202	(1-y)Li <sub>2.02</sub> Ti <sub>0.92</sub> Nb <sub>0.06</sub> O <sub>3</sub> (y=0.6)	1070		46.8	8040		35	722
3203	(Ba <sub>1-x</sub> Sr <sub>x</sub> )La <sub>4</sub> Ti <sub>4</sub> O <sub>15</sub> (x=0.2)	1450	Trigonal perovskite P-3m1	46.8	24500		-8	1356
3204	Ba <sub>2-x</sub> Sr <sub>x</sub> La <sub>3</sub> Ti <sub>3</sub> NbO <sub>15</sub> (x=0.75)	1510	Trigonal perovskite P-3m1	46.8	36500		2	1301
3205	Ba <sub>1-x</sub> Ca <sub>x</sub> (Sc <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> (x=0.5)	1650	Perovskite	46.9	28000			1371
3206	La <sub>2</sub> Ti <sub>2</sub> O <sub>7</sub>		Monoclinic P21	47.0	8500	7.8	-10	1137
3207	0.75CaTiO <sub>3</sub> -0.25LaAlO <sub>3</sub>	1450/12h	Composite	47.0	36000		13	1174
3208	Bi <sub>2</sub> Ti <sub>4</sub> O <sub>11</sub>		Monoclinic C2/m	47.0	4800		-540	1372
3209	Ca <sub>2</sub> Zn <sub>4</sub> Ti <sub>15</sub> O <sub>36</sub>	1150/8h	Hexagonal+residual rutile	47.0	41200	10	120	1026
3210	Na <sub>1-x</sub> K <sub>x</sub> Ca <sub>4</sub> Nb <sub>5</sub> O <sub>17</sub> (x=0.5)	1300	Monoclinic P21/a A <sub>n</sub> B <sub>n</sub> O <sub>3n+2</sub>	47.0	5000		-23	1333
3211	BaTi <sub>0.3</sub> Ga <sub>0.35</sub> Nb <sub>0.35</sub> O <sub>3</sub>	1500/4h	Perovskite-Mixture	47.0	2470	5.5		1373
3212	0.65CaTiO <sub>3</sub> -0.35LaGaO <sub>3</sub>	1600	Perovskite Orthorhombic Pnma	47.0	40000		0	912
3213	Ba <sub>2-x</sub> Sr <sub>x</sub> La <sub>3</sub> Ti <sub>3</sub> NbO <sub>15</sub> (x=0.25)	1490	Hexagonal P-3m1	47.0	29400		6	1301
3214	Ba <sub>2</sub> La <sub>3</sub> Ti <sub>3</sub> NbO <sub>15</sub>	1470/6h	Hexagonal perovskite P-3m1	47.0	2000		20	1374
3215	Ba <sub>2-x</sub> Sr <sub>x</sub> La <sub>3</sub> Ti <sub>3</sub> NbO <sub>15</sub> (x=0.75)	1510	Trigonal perovskite P-3m1	47.0	36500		2	1297
3216	Ba <sub>2-x</sub> Sr <sub>x</sub> La <sub>3</sub> Ti <sub>3</sub> NbO <sub>15</sub> (x=0.25)	1490	Trigonal perovskite P-3m1	47.0	29400		8	1297
3217	0.222Li <sub>2</sub> O-0.668Nb <sub>2</sub> O <sub>5</sub> -0.11TiO <sub>2</sub>	1350		47.0	25000		0	760
3218	Ca <sub>5</sub> Nb <sub>2</sub> TiO <sub>12</sub> +1 wt% ZnO	1550/4h	Complex perovskite Orthorhombic Pnma	47.0	28000		34	1155

3219	Ba <sub>3</sub> Ti <sub>2</sub> (Mg <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>2</sub> Nb <sub>4</sub> O <sub>21</sub> +5 wt% 2ZnO-V <sub>2</sub> O <sub>5</sub>	900	Hexagonal	47.0	10500		16	1375
3220	0.6Ca(Mg <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub> - 0.4Ca <sub>0.61</sub> Nd <sub>0.26</sub> TiO <sub>3</sub>	1375		47.0	37000		5	1376
3221	Pr <sub>0.6</sub> Gd <sub>0.4</sub> TiNbO <sub>6</sub>	1400	Not available	47.1	9500		44	564
3222	0.76ZrTi <sub>2</sub> O <sub>6</sub> -0.24ZnNb <sub>2</sub> O <sub>6</sub>	1260/4h oxygen	Mixed phases	47.1	34200		0	1283
3223	0.5La(Mg <sub>0.5</sub> Ti <sub>0.5</sub> )O <sub>3</sub> -0.5Ca <sub>0.8</sub> Sr <sub>0.2</sub> TiO <sub>3</sub>	1475	Composite	47.1	35000		-5	1377
3224	SrCa <sub>4</sub> Nb <sub>4</sub> TiO <sub>17</sub>	1475	Not available	47.2	12000		-137	1378
3225	TiFeNbO <sub>6</sub>	1125/5h	Tetragonal	47.2	2300	3.68	281	1379
3226	Ca[Ti <sub>1-x</sub> (Mg <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>x</sub> ]O <sub>3</sub> (x=0.6)	1450/4h	Perovskite	47.3	25630		8	1271
3227	Ba <sub>3</sub> La <sub>3</sub> Ti <sub>4</sub> NbO <sub>18</sub>	1480/6h	Trigonal perovskite P-3m1	47.4	17330	5.18	35	1380
3228	(1-x)(Ba <sub>0.6</sub> Sr <sub>0.4</sub> La <sub>4</sub> Ti <sub>4</sub> O <sub>13</sub> -x TiO <sub>2</sub> (x=0.05)	1550	Hexagonal Perovskite	47.4	46800		-3	1381
3229	Bi <sub>8</sub> TiO <sub>14</sub>			47.4	5400		-16	1382
3230	0.66CaTiO <sub>3</sub> -0.34LaGaO <sub>3</sub>		Rhombic perovskite	47.5	46000		4	1269
3231	Ca <sub>5</sub> Nb <sub>2</sub> TiO <sub>12</sub> +0.5 wt% MgO	1550/4h	Complex perovskite Orthorhombic Pnma	47.5	33000		34	1155
3232	Ca <sub>5</sub> Nb <sub>2</sub> TiO <sub>12</sub> +0.5 wt% CuO	1550/4h	Complex perovskite Orthorhombic Pnma	47.5	30000		37	1155
3233	11Li <sub>2</sub> O-3Nb <sub>2</sub> O <sub>5</sub> -12TiO <sub>2</sub> +LBS glass	900	Mixture	47.5	9600		50	2
3234	0.5MgTiO <sub>3</sub> -0.5CaTiO <sub>3</sub> - 0.25(Nd <sub>2</sub> O <sub>3</sub> -TiO <sub>2</sub> )		Composite	47.6	30000		8	1383
3235	TiTe <sub>3</sub> O <sub>8</sub> +1 wt% SiO <sub>2</sub>	750	Cubic Ia3	47.6	48800		152	1384
3236	(Ba <sub>1-x</sub> Ca <sub>x</sub> )La <sub>4</sub> Ti <sub>4</sub> O <sub>15</sub> (x=0.2)	1575/4h	Trigonal P-3m1 Perovskite	47.7	47100		-8	1356
3237	(Ba <sub>1-x</sub> Ca <sub>x</sub> )La <sub>4</sub> Ti <sub>4</sub> O <sub>15</sub> (x=0.4)	1575/4h	Trigonal P-3m1 Perovskite	47.7	47400		-7	1356
3238	0.45La(Mg <sub>0.5</sub> Ti <sub>0.5</sub> ) O <sub>3</sub> -0.55Ca <sub>0.8</sub> Sm <sub>0.4/3</sub> TiO <sub>3</sub>		Perovskite	47.8	26500	6.2	-2	1385
3239	Ba <sub>5</sub> SrNb <sub>4</sub> TiO <sub>18</sub>	1450/2h	A <sub>6</sub> B <sub>5</sub> O <sub>18</sub> type perovskite	47.9	7000		83	895
3240	Ba(Gd <sub>0.3</sub> Bi <sub>0.2</sub> Nb <sub>0.5</sub> )O <sub>3</sub>	1300	Perovskite	47.9	2100		-3	1341
3241	Ba <sub>x</sub> La <sub>4</sub> Ti <sub>3+x</sub> O <sub>12+3x</sub> (x=2.5)			47.9	19480			1310
3242	Ba <sub>3</sub> La <sub>2</sub> Ti <sub>2</sub> Nb <sub>2-x</sub> Ta <sub>x</sub> O <sub>15</sub> (x=0.5)	1480		47.9	25300	-	2	1353
3243	Bi <sub>0.75</sub> Ce <sub>0.25</sub> VO <sub>4</sub>	900	Monoclinic	47.9	18000	7.6	15	1386

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No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
3244	$\text{Pb}_{0.75}\text{Ca}_{0.25}(\text{Cr}_{1/2}\text{Nb}_{1/2})\text{O}_3$		Perovskite	48.0	3600	4.3	8	996
3245	$0.65\text{CaTiO}_3\text{-}0.35\text{LaGaO}_3$	1450/12h	Perovskite Orthorhombic	48.0	32000		2	1174
3246	$\text{Ca}[(\text{Li}_{1/3}\text{Ta}_{2/3})_{1-x}\text{Ti}_x]\text{O}_{3-\delta}+3 \text{ wt\% B}_2\text{O}_3$ ( $x=0.5$ )	1150	Perovskite	48.0	21000		–	765
3247	$\text{Ca}_5\text{Nb}_2\text{TiO}_{12}$	1550	Complex perovskite Orthorhombic Pnma	48.0	26600	3.7	40	1307
3248	$\text{Ca}_3\text{Ba}_2\text{Ta}_2\text{TiO}_{12}$	1540	Complex perovskite Cubic	48.0	3000	3.8	18	1307
3249	$\text{Ba}_3\text{Ti}_4\text{Ta}_4\text{O}_{21}$	1380	Hexagonal $\text{P6}_3/\text{mcm}$	48.0	7000	4.3	50	1208
3250	$(\text{Ca}_{1-0.3x}\text{La}_{0.2x})[(\text{Mg}_{1/3}\text{Ta}_{2/3})]_{1-x}\text{Ti}_x\text{O}_3$ ( $x=0.5$ )		Orthorhombic Pnnm complex Perovskite	48.0	21000		2	1387
3251	$\text{Pr}_{0.7}\text{Gd}_{0.3}\text{TiNbO}_6$	1400		48.0	4500		47	564
3252	$\text{Ba}_4\text{SrNb}_4\text{O}_{15}(\text{A}_n\text{B}_{n-1}\text{O}_{3n})$	1400	Hexagonal perovskite	48.0	14600	4.7	140	325
3253	$0.34\text{CaTiO}_3\text{-}0.66\text{Ca}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$	1450	Perovskite	48.0	32500		–2	1388
3254	$\text{CaTi}_{0.5}(\text{Al}_{1/2}\text{Nb}_{1/2})_{.5}\text{O}_3$	1500/5h	Perovskite orthorhombic	48.0	26100	7	–4	1152
3255	$\text{CaTi}_{0.5}(\text{Al}_{1/2}\text{Nb}_{1/2})_{.5}\text{O}_3+1 \text{ wt\% Li}_3\text{NbO}_4$	1300/5h	Perovskite orthorhombic	48.0	32100	7	–2	1152
3256	$\text{Ba}_8\text{Nb}_4\text{Ti}_3\text{O}_{24}$	1450	Hexagonal $\text{P6}_3/\text{mmc}$	48.0	23500	5.5	115	1389
3257	$\text{Sr}_2\text{La}_4\text{Ti}_5\text{O}_{18}$	1625/2h		48.0	27350		20	895
3258	$\text{Sr}_5\text{LaTi}_2\text{Nb}_3\text{O}_{18}$	1520		48.0	27800	4.3		1390
3259	$\text{Ba}_4\text{Sm}_{9.33}\text{Ti}_{18}\text{O}_{54}+15 \text{ wt \% BaCu}(\text{B}_2\text{O}_5)$	950	Tungsten Bronze Orthorhombic	48.0	5500		–41	1391
3260	$(\text{Ca}_{1-0.3x}\text{La}_{0.2x})[(\text{Mg}_{1/3}\text{Ta}_{2/3})]\text{O}_3$ ( $x=0.5$ )		Orthorhombic Pbnm	48.0	21000			1387
3261	$[(\text{Ca},\text{Sr})_x(\text{La},\text{Nd})_{2/3-2x/3}]\text{TiO}_3$ ( $x=0.1$ )	1350/24h	Tetragonal $\text{I4}/\text{mcm}$	48.0	3700		61	1392
3262	$0.5\text{La}(\text{Mg}_{1/2}\text{Ti}_{1/2})\text{O}_3\text{-}0.5\text{SrTiO}_3$		Perovskite Pbnm	48.1	5800	6.6		978
3263	$\text{Ba}_3\text{LaNb}_3\text{O}_{12}$	1350/6h	Trigonal R-3m	48.3	38000	6.76	–40	1315
3264	$\text{Ba}_{2-x}\text{Sr}_x\text{La}_3\text{Ti}_3\text{NbO}_{15}$ ( $x=0$ )	1480	Hexagonal perovskite	48.3	20290		8	1301
3265	$0.2\text{SrTiO}_3\text{-}0.8\text{Ca}_{0.61}\text{Nd}_{0.26}\text{Ti}_{1-x}\text{Al}_{4x/3}\text{O}_3$ ( $x=0.5$ )	1520/4h	Orthorhombic Perovskite	48.3	40700		4	1393
3266	$\text{Ca}_2\text{Zn}_4\text{Ti}_{16}\text{O}_{38}$	1100/4h	Trigonal R-3	48.4	31600	6.7	48	1394
3267	$\text{Ca}_5\text{Nb}_2\text{TiO}_{12}+1 \text{ wt\% SnO}_2$	1550/4h	Complex perovskite Orthorhombic Pnma	48.5	28000		36	1155
3268	$\text{CaLa}_8\text{Ti}_9\text{O}_{31}$	1550	Orthorhombic Pbam Perovskite	48.6	19350	3.65	–6	1272
3269	$\text{Ba}(\text{Dy}_{0.3}\text{Bi}_{0.2}\text{Nb}_{0.5})\text{O}_3$	1300	Perovskite	48.6	2000		6	1341

3270	0.64CaTiO <sub>3</sub> -0.36LaGaO <sub>3</sub>	1300	Perovskite	48.7	38000		1395
3271	Ca <sub>5</sub> Nb <sub>2</sub> TiO <sub>12</sub> +1 wt% Al <sub>2</sub> O <sub>3</sub>	1550/4h	Complex perovskite Orthorhombic Pnma	48.7	29000	33	1155
3272	5.7Li <sub>2</sub> O-Nb <sub>2</sub> O <sub>5</sub> -14.7TiO <sub>2</sub> +2 wt% B <sub>2</sub> O <sub>3</sub> -CuO	900		48.7	16350	32	760
3273	Sr <sub>2</sub> La <sub>4</sub> Ti <sub>5</sub> O <sub>18</sub> +0.3 wt% Bi <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub> glass	1625/2h		48.7	23000	22	895
3274	Ba <sub>(1-x)</sub> Ca <sub>x</sub> )La <sub>4</sub> Ti <sub>4</sub> O <sub>15</sub> (x=0.4)	1575/4h	Trigonal perovskite P-3m1	48.9	42400	-7	1356
3275	(Ba <sub>1-x</sub> Ca <sub>x</sub> )La <sub>4</sub> Ti <sub>4</sub> O <sub>15</sub> (x=0.6)	1575	Trigonal perovskite P-3m1	48.9	41200	-7	1356
3276	0.45La(Zn <sub>0.395</sub> Ti <sub>0.385</sub> Ta <sub>0.01</sub> Al <sub>0.21</sub> )O <sub>3</sub> - 0.55CaTiO <sub>3</sub>		Composite	49.0	29000	1.957	0 1327
3277	Ca <sub>5</sub> Nb <sub>2</sub> TiO <sub>12</sub> +1 wt% Cr <sub>2</sub> O <sub>3</sub>	1550/4h	Complex perovskite Orthorhombic Pnma	49.0	34000	44	1155
3278	Ca <sub>5</sub> Nb <sub>2</sub> TiO <sub>12</sub> +1 wt% Sb <sub>2</sub> O <sub>3</sub>	1550/4h	Complex perovskite Orthorhombic Pnma	49.0	30500	36	1155
3279	0.9Bi <sub>2</sub> O <sub>3</sub> -0.1Nb <sub>2</sub> O <sub>5</sub>	900/3h	Flurite δ-Bi <sub>2</sub> O <sub>3</sub> Fm-3m	49.0	800	-234	1396
3280	Ca(Zr <sub>0.8</sub> Ti <sub>0.2</sub> )O <sub>3</sub>		Perovskite orthorhombic Pcnm	49.0	10800		906
3281	0.7CaTiO <sub>3</sub> -0.3NdGaO <sub>3</sub>	1450/12h	Perovskite	49.0	32000	35	1174
3282	0.66CaTiO <sub>3</sub> -0.34(La <sub>0.5</sub> Nd <sub>0.5</sub> ) GaO <sub>3</sub>	1540	Perovskite	49.0	43000	0	1269
3283	11Li <sub>2</sub> O-3Nb <sub>2</sub> O <sub>5</sub> -12TiO <sub>2</sub> +0.5 wt% B <sub>2</sub> O <sub>3</sub>	900	M phase+Li <sub>2</sub> TiO <sub>3</sub>	49.2	8840	58	1397
3284	Ca <sub>4</sub> La <sub>2</sub> Ti <sub>5-x</sub> (Mg <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>x</sub> O <sub>17</sub> (x=2)	1540	Orthorhombic Pbnm	49.2	16000	32	1152
3285	Ca <sub>2</sub> La <sub>4</sub> Ti <sub>5</sub> O <sub>18</sub>		Trigonal perovskite R	49.3	20100	6	1272
3286	0.7CaTiO <sub>3</sub> -0.3LaGaO <sub>3</sub>		Perovskite	49.4	29000	8	22 1269
3287	CaTi <sub>0.53</sub> Al <sub>1/2</sub> Nb <sub>1/2</sub> ) <sub>0.47</sub> O <sub>3</sub> +1 wt% Li <sub>3</sub> NbO <sub>4</sub>	1300/5h	Perovskite Orthorhombic	49.4	31400	7	12 1152
3288	Ba <sub>3</sub> LiTa <sub>3</sub> Ti <sub>5</sub> O <sub>21</sub>	1200	Perovskite Hexagonal P6 <sub>3</sub> /mcm	49.4	3100	472	1398
3289	(Ba <sub>1-x</sub> Ca <sub>x</sub> )La <sub>4</sub> Ti <sub>4</sub> O <sub>15</sub> (x=0.8)	1575	Trigonal perovskite P-3m1	49.5	42400	-5	1356
3290	Pr <sub>0.8</sub> Gd <sub>0.2</sub> TiNbO <sub>6</sub>	1400	Euxenite OrthorhombicPnma	49.5	9500	51	564
3291	Ba <sub>4</sub> LaNb <sub>2</sub> TaO <sub>15</sub>		Hexagonal perovskite	49.5	24100	75	1355
3292	(Ni <sub>1/3</sub> Ta <sub>2/3</sub> ) <sub>1-x</sub> Ti <sub>x</sub> O <sub>2</sub> (x=0.4)	1300	Tetragonal P4 <sub>2</sub> /mmm	49.6	17600	40	1276
3293	CaTi <sub>0.53</sub> (Al <sub>1/2</sub> Nb <sub>1/2</sub> ) <sub>0.47</sub> O <sub>3</sub>	1500/5h	Perovskite	49.8	26000	7	7 1152
3294	Ba <sub>3</sub> La <sub>2</sub> Ti <sub>2</sub> Nb <sub>2</sub> O <sub>15</sub> (A <sub>5</sub> B <sub>4</sub> O <sub>15</sub> )	1460	Hexagonal perovskite	49.8	22000	5	7 1297

(continued)



No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
3295	$\text{Li}_{1+x+y}\text{Ta}_{1-x-3y}\text{Ti}_{x+4y}\text{O}_3$ ( $x=0.1$ , $y=0.175$ )	1175/1h	M-Phase	49.8	10528		32	1399
3296	$\text{Ba}_6\text{Ti}_{14}\text{Nb}_2\text{O}_{39}$	1260/4h	Orthorhombic Bm21b	50.0	2600	4	165	1401
3297	$\text{Ca}[(\text{Li}_{1/3}\text{Nb}_{2/3})_{0.9}\text{Ti}_{0.3}\text{O}_{3-d}+1 \text{ wt}\% \text{B}_2\text{O}_3]$	940	Perovskite	50.0	6500		-8	1402
3298	$\text{Pb}_{0.7}\text{Ca}_{0.3}\text{La}_{0.5}(\text{Mg}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1350/2h	Perovskite Cubic Fm3m	50.0	86000		0	1403
3299	$0.5\text{La}(\text{Mg}_{1/2}\text{Ti}_{1/2})\text{O}_3-0.5\text{La}_{2/3}\text{TiO}_3$	1400/2h	Perovskite	50.0	10000		5	1404
3300	$0.5\text{CaTiO}_3-0.5\text{La}(\text{Zn}_{1/2}\text{Ti}_{1/2})\text{O}_3$	1550/3h	Perovskite Orthorhombic	50.0	38000	7	0	1405
3301	$\text{Ba}_2\text{Sr}_3\text{Nb}_4\text{O}_{15}(\text{A}_n\text{B}_{n-1}\text{O}_{3n})$	1400	Hexagonal perovskite	50.0	16500	4.7	232	325
3302	$\text{La}_{0.33}\text{TaO}_3$	1525	Perovskite Tetragonal P4/mmm	50.0	8000	3.8	144	1406
3303	$\text{Ca}_5\text{Nb}_2\text{TiO}_{12}+0.1 \text{ wt}\% 2\text{MgO-Al}_2\text{O}_3-5\text{SiO}_2$	1520/2h	Orthorhombic Pnma	50.0	30000	4	38	1407
3304	$\text{TiTe}_3\text{O}_8$	720	Cubic Ia3	50.0	30600	5	133	586
3305	$(1-x)(\text{Mg}_{0.95}\text{Zn}_{0.05})\text{TiO}_3-x\text{Ca}_{0.6}\text{La}_{0.8/3}\text{TiO}_3$ ( $x=0.5$ )	1320/4h		50.0	43500		122	465
3306	$\text{Ba}_3\text{Ti}_2(\text{Fe}_{1/2}\text{Nb}_{1/2})\text{Nb}_4\text{O}_{21}$	1280	Hexagonal	50.0	5200		10	1408
3307	$\text{Ba}_3\text{Ti}_{4-x}(\text{Mg}_{1/3}\text{Nb}_{2/3})_x\text{O}_{21}+\text{BaCu}(\text{B}_2\text{O}_5)$ ( $x=2$ )	950	Hexagonal	50.0	10500		18	1409
3308	$\text{Ca}_{4-x}\text{Mg}_x\text{La}_2\text{T}_5\text{O}_{17}$ ( $x=2$ )			50.0	9450		63	1029
3309	$\text{Ca}(\text{Zr}_x\text{Ti}_{1-x})\text{O}_3$ ( $x=0.6$ )	1470/15h	Perovskite Orthorhombic Pbnm	50.0	3800	3.46	460	916
3310	$\text{NiNb}_2\text{O}_6+40 \text{ wt}\% \text{TiO}_2$	1300/2h	Composite	50.0	5700	6	99	1345
3311	$3\text{Li}_2\text{O-Nb}_2\text{O}_5-3\text{TiO}_2+2 \text{ wt}\% \text{B}_2\text{O}_3-\text{CuO}$	900	M phase+ $\text{Li}_2\text{TiO}_3$	50.1	8300		35	1410
3312	$(1-x)\text{La}_{2/3}\text{TiO}_3-x\text{NiTiO}_3$ ( $x=0.2$ )	1340	Perovskite	50.7	13900	3.5	24	1411
3313	$\text{Sr}_5\text{LaTi}_2\text{Nb}_3\text{O}_{18}$	1520		50.7	27800		19	1412
3314	$\text{Ba}_{0.2}\text{Sr}_{0.8}\text{LaTi}_4\text{O}_{15}+1 \text{ wt}\% \text{La}_2\text{O}_3-0.5\text{B}_2\text{O}_3-0.5\text{TiO}_2$	1550/3h	Hexagonal perovskite	50.7	72700		-7	1413
3315	$\text{Ba}(\text{Sm}_{0.3}\text{Bi}_{0.2}\text{Nb}_{0.5})\text{O}_3$	1300	Perovskite	50.8	1600		14	1341
3316	$\text{Ba}_2\text{SrNb}_4\text{TiO}_{18}$	1450/4h		50.8	7000		83	895
3317	$0.75\text{CaTiO}_3-0.25\text{SmAlO}_3$	1450/12h	Perovskite Orthorhombic	51.0	31000		31	1174
3318	$0.7\text{CaTiO}_3-0.3\text{SmGaO}_3$	1450/12h	Perovskite Orthorhombic	51.0	18000		41	1174
3319	$\text{Ba}_3\text{Sr}_2\text{Nb}_4\text{O}_{15}(\text{A}_n\text{B}_{n-1}\text{O}_{3n})$	1400	Hexagonal Perovskite	51.0	21200	4.6	117	325
3320	$\text{Ca}_{0.6}(\text{Li}_{0.5}\text{Nd}_{0.5/.4})_{0.45}\text{Zn}_{0.55}\text{TiO}_3$	1150		51.0	12700		17	1281
3321	$\text{Pr}_{0.9}\text{Gd}_{0.1}\text{TiNbO}_6$	1400	Euxenite Orthorhombic Pnma	51.0	8400		53	564

3322	Zr <sub>0.3</sub> (Zn <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>0.7</sub> TiO <sub>4</sub>	1290		51.0	26600		70	1414
3323	Na <sub>1-x</sub> K <sub>x</sub> Ca <sub>4</sub> Nb <sub>5</sub> O <sub>17</sub> (x=1)	1300	MonoclinicP21/a A <sub>n</sub> B <sub>n</sub> O <sub>3n+2</sub>	51.0	2300		473	1333
3324	Sr <sub>0.5</sub> Ba <sub>0.5</sub> Ca <sub>4</sub> Nb <sub>4</sub> TiO <sub>17</sub>		Orthorhombic Pnnm	51.6	10200	5.37	-14	1415
3325	0.3La(Mg <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> -0.7CaTiO <sub>3</sub>	1500	Perovskite Pbnm	51.2	43800	5.8	-	932
3326	3Li <sub>2</sub> O-Nb <sub>2</sub> O <sub>5</sub> -3TiO <sub>2</sub> +1 wt% 0.83Li <sub>2</sub> O-0.17V <sub>2</sub> O <sub>5</sub>	900	M-Phase+Li <sub>2</sub> TiO <sub>3</sub>	51.3	7200		22	1416
3327	TiFeNbO <sub>6</sub> +2 wt% Bi <sub>2</sub> O <sub>3</sub>	1125/5h	Tetragonal	51.3	1400	3.6	103	1379
3328	(1-x)La <sub>2/3</sub> TiO <sub>3</sub> -xNiTiO <sub>3</sub> (0.01)	1380	Perovskite	51.4	1600	3.55	25	1411
3329	Ba <sub>3</sub> La <sub>2</sub> Ti <sub>2</sub> Nb <sub>2</sub> O <sub>15</sub>	1450		51.5			15	1417
3330	Ca[(Ga <sub>1/2</sub> Nb <sub>1/2</sub> ) <sub>1-x</sub> Ti <sub>x</sub> ]O <sub>3</sub> (x=0.47)		Pbnm	51.6	34100		0	1418
3331	(Pb <sub>0.2</sub> Ca <sub>0.8</sub> )[(Ca <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>0.8</sub> Ti <sub>0.2</sub> ]O <sub>3</sub>	1350/3h	Perovskite	51.7	7270		0	1419
3332	Ba <sub>0.5</sub> Ca <sub>0.5</sub> (Fe <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>		Perovskite	51.7	960	6.9	45	1163
3333	Bi <sub>2</sub> (Zn <sub>1/3</sub> Ta <sub>2/3</sub> ) <sub>2</sub> O <sub>7</sub>	850	Cubic Fd3m	51.8	2600		-26	1420
3334	0.3LaAlO <sub>3</sub> -0.7SrTiO <sub>3</sub>	1680	Perovskite	52.0	50800	9.3	56	832
3335	(Li <sub>1/2</sub> Sm <sub>1/2</sub> )TiO <sub>3</sub>	1300	Perovskite Orthorhombic	52.0	2290	3	-266	1421
3336	Ca <sub>4</sub> SrNb <sub>2</sub> TiO <sub>12</sub>	1550	Orthorhombic Pnma	52.0	15000	3.59	42	1209
3337	Ce <sub>0.33</sub> TaO <sub>3</sub>	1525		52.0	10000	3.58	159	1406
3338	NdTiNbO <sub>6</sub>	1370	Euxenite Orthorhombic Pnma	52.0	4480	4.93	46	563
3339	Pr <sub>0.95</sub> Gd <sub>0.05</sub> TiNbO <sub>6</sub>	1370	Euxenite Orthorhombic Pnma	52.0	18500		54	564
3340	CaTi <sub>0.6</sub> (Al <sub>1/2</sub> Ta <sub>1/2</sub> ) <sub>0.4</sub> O <sub>3</sub>	1500/15h	Perovskite Orthorhombic	52.0	13200	8	37	1266
3341	0.7CaTiO <sub>3</sub> -0.3LaGaO <sub>3</sub>	1450/12h	Perovskite	52.0	27000		40	1174
3342	Ba <sub>4</sub> LaTiNb <sub>3</sub> O <sub>15</sub> (A <sub>5</sub> B <sub>4</sub> O <sub>15</sub> )	1450	Hexagonal perovskite	52.0	15600	4.47	93	1210
3343	Ba <sub>4</sub> Sm <sub>9.33</sub> Ti <sub>18</sub> O <sub>54</sub> +10 wt% BaCu(B <sub>2</sub> O <sub>5</sub> )	950	Orthorhombic	52.0	4000		-29	1422
3344	Ba <sub>6-3x</sub> Sm <sub>8+2x</sub> Ti <sub>18</sub> O <sub>54</sub> (x=2/3)+3.5 Bi <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub>	1050	Tungsten bronze Orthorhombic	52.0	4500		6	1422
3345	3Li <sub>2</sub> O-Nb <sub>2</sub> O <sub>5</sub> 6TiO <sub>2</sub> +21 wt% B <sub>2</sub> O <sub>3</sub>	900		52.0	12000		32	760
3346	Ca <sub>5-x</sub> Zn <sub>x</sub> Nb <sub>4</sub> TiO <sub>17</sub> (x=0.4)	1260	Perovskite A <sub>n</sub> B <sub>n</sub> O <sub>3n+2</sub>	52.0	9950		-9	1423
3347	Ba <sub>0.9</sub> Ca <sub>0.1</sub> (Fe <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>		Perovskite	52.1	620	6.8	45	1163
3348	Pb <sub>0.4</sub> Ca <sub>0.6</sub> (Mg <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>1-x</sub> Sn <sub>x</sub> ]O <sub>3</sub> (x=0.1)	1280/2h	Perovskite Tetragonal	52.2	8150	5	-3	1424
3349	CaTi <sub>0.5</sub> (Fe <sub>0.5</sub> Nb <sub>0.5</sub> ) <sub>0.5</sub> O <sub>3</sub> +3 wt% B <sub>2</sub> O <sub>3</sub>	900/2h	Perovskite orthorhombic	52.3	2930		13	1425
3350	0.4(La <sub>1/2</sub> Na <sub>1/2</sub> )TiO <sub>3</sub> - 0.6Ca(Mg <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub>	1450	Perovskite Orthorhombic	52.3	29700	6	2	1426

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
3351	0.5Ca <sub>0.6</sub> La <sub>0.267</sub> TiO <sub>3</sub> - 0.5Ca(Mg <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub>	1490/4h	Perovskite Composite	52.4	36400	5.8	3	1427
3352	Sr <sub>1-x</sub> Ca <sub>x</sub> La <sub>4</sub> Ti <sub>5</sub> O <sub>17</sub> (x=0.85)	1580/6h	Orthorhombic Pnnm	52.4	12600		-23	1428
3353	Sr <sub>1-x</sub> Ca <sub>x</sub> La <sub>4</sub> Ti <sub>5</sub> O <sub>17</sub> (x=1)	1580/6h	Orthorhombic Pnnm	52.7	12700		-37	1428
3354	(1-x)Sr <sub>0.2</sub> Na <sub>0.4</sub> Sm <sub>0.4</sub> TiO <sub>3</sub> -SmAlO <sub>3</sub> (x=0.25)	1470/4h	Orthorhombic perovskite	52.7	9700		2	1429
3355	Pb <sub>0.2</sub> Ca <sub>0.8</sub> (Fe <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>		Perovskite	53.0	10000	4.1	-69	996
3356	Bi <sub>2</sub> Ti <sub>4</sub> O <sub>11</sub>	1100	Monoclinic C2/m	53.0	4900		-520	1372
3357	Ba <sub>3</sub> Ti <sub>4-x</sub> (Zn <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>x</sub> Nb <sub>4</sub> O <sub>21</sub> (x=2),+1 wt% MnCO <sub>3</sub> -CuO+1 wt% ZBS	900/2h		53.0	14600		6	1430
3358	PrTiNbO <sub>6</sub>	1370	Euxenite Orthorhombic Pnma	53.0	12300	4.85	56	563
3359	Ba <sub>3</sub> Ti <sub>4-x</sub> (Zn <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>x</sub> Nb <sub>4</sub> O <sub>21</sub> (x=2)+1 wt% ZBS+1 wt% MnCO <sub>3</sub> -CuO	900/2h	Hexagonal P6 <sub>3</sub> /mcm	53.0	14600		6	1430
3360	BaLa <sub>4</sub> Ti <sub>4</sub> O <sub>15</sub> (textured)	1600/2h	Hexagonal Perovskite P-3m1	53.0	41400		-1	1431
3361	(Ca <sub>1-x</sub> Nd <sub>2x/3</sub> )TiO <sub>3</sub> (x=0.3)+2 wt% CaO-ZnO-B <sub>2</sub> O <sub>3</sub>	900/1h	Perovskite Orthorhombic	53.0	3800		55	1432
3362	Ca <sub>0.02</sub> Zn <sub>1.98</sub> Sn <sub>0.08</sub> Ti <sub>1.92</sub> Nb <sub>2</sub> O <sub>8</sub>	1120/6h		53.1	48000	21		1433
3363	0.8TiO <sub>2</sub> -0.2Bi <sub>2</sub> O <sub>3</sub>		Mixture phases	53.2	4500		-550	1434
3364	(1-x)La <sub>2/3</sub> TiO <sub>3</sub> -xNiTiO <sub>3</sub> (0.15)	1340	Perovskite	53.3	12950	3.4	21	1411
3365	CaLa <sub>4</sub> Ti <sub>5</sub> O <sub>17</sub>	1550	Perovskite Orthorhombic Pnnm	53.7	17400	3.7	-26	1272
3366	Sr <sub>1-x</sub> Ca <sub>x</sub> La <sub>4</sub> Ti <sub>5</sub> O <sub>17</sub> (x=1)	1580/6h	Orthorhombic Pnnm Perovskite	53.7	11500		-1	1428
3367	0.8La <sub>2/3</sub> TiO <sub>3</sub> -0.2LaAlO <sub>3</sub>	1400	Perovskite Orthorhombic	53.9	29000	5.4	35	1096
3368	CeTiNbO <sub>6</sub>	1360	Euxenite Orthorhombic Pnma	54.0	6530	4.4	67	563
3369	0.4CaTiO <sub>3</sub> -0.6Ca(Mg <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub>	1450	Perovskite	54.0	32000	6.7	18	944
3370	0.8La <sub>2/3</sub> TiO <sub>3</sub> -0.2LaAlO <sub>3</sub>	1400	Perovskite	54.0	29000		35	1096
3371	Ca <sub>3</sub> Sr <sub>2</sub> Nb <sub>2</sub> TiO <sub>12</sub>	1540	Orthorhombic Pnma	54.0	10000	3.5	45	1209
3372	Y <sub>2</sub> O <sub>3</sub> -2TiO <sub>2</sub>	1460	Mixed phases	54.0	6565	4.65	-31	1435
3373	Ba <sub>6-3x</sub> Sm <sub>8+2x</sub> Ti <sub>18</sub> O <sub>54</sub> (x=2/3)+3.5 wt% Bi <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub> +1.5 wt% LiF	1050	Tungsten Bronze Orthorhombic	54.0	3400		29	1422
3374	(Ca <sub>0.85</sub> Nd <sub>0.1</sub> )[Ti <sub>0.5</sub> (Mg <sub>0.33</sub> Nb <sub>0.67</sub> ) <sub>0.5</sub> ]O <sub>3</sub>		—	54.1	7660		1	1436
3375	0.48Nd(Zn <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> -0.52SrTiO <sub>3</sub>	1350	Composite	54.2	84000		0	1437

3376	$\text{Ca}[\text{Ti}_{1-x}(\text{Mg}_{1/3}\text{Nb}_{2/3})_x]\text{O}_3$ ( $x=0.5$ )	14504h		54.3	22900		39	1271
3377	$\text{Ba}(\text{Ti}_{0.85}\text{Mn}_{0.15})\text{O}_3+10 \text{ wt}\% \text{ B}_2\text{O}_3$	1100	Composite	54.4	3400		254	1319
3378	$\text{Ba}_{0.6}\text{Ca}_{0.4}(\text{Fe}_{1/2}\text{Nb}_{1/2})\text{O}_3$		Perovskite	54.5	600	6.6	55	1163
3379	$\text{Ba}(\text{Ti}_{0.85}\text{Mn}_{0.15})\text{O}_3+15 \text{ wt}\% \text{ Bi}_2\text{O}_3$	900	Perovskite	54.7	1300		183	1319
3380	$\text{Li}_{1+x+y}\text{Ta}_{1-x-3y}\text{Ti}_{x+4y}\text{O}_3$ ( $x=0.1$ , $y=0.15$ )	1175/1h	M-Phase	54.8	10400		34	1400
3381	$\text{Ba}[\text{Zn}_{1/4}\text{Ti}_{1/4}\text{Nb}_{1/2}]\text{O}_3$	1400	Perovskite cubic	54.8	13200	6.1		1228
3382	$\text{CaLa}_8\text{Ti}_9\text{O}_{31}$		Orthorhombic Pbam	54.9	19300		-6	1272
3383	$\text{Li}_{1+x-y}\text{Nb}_{1-x-y}\text{Ti}_{x+4y}\text{O}_3$ ( $x=0.1$ , $y=0.175$ )	1100/1h	M-Phase	54.9	8890	6.2	28	1400, 1438
3384	$\text{Ba}_3\text{LiNb}_3\text{Ti}_5\text{O}_{21}$	1200	Hexagonal $\text{P6}_3/\text{mcm}$	54.9	3200		472	1398
3385	$\text{Ba}_{0.75}\text{Sr}_{0.25}(\text{Nd}_{0.75}\text{Bi}_{0.25})_2\text{Ti}_4\text{O}_{12}+20 \text{ wt}\% \text{ La}_2\text{O}_3\text{-B}_2\text{O}_3\text{-ZnO-CaO}$	900	Multiphase	54.9	2900		17	1439
3386	$\text{Ga}_{0.5}\text{Nb}_{0.5}\text{TiO}_4$	1250	Tetragonal $\text{P42}/\text{mnm}$	54.9	16600		165	1250
3387	$\text{Ba}_3\text{Ti}_4\text{Nb}_4\text{O}_{21}$	1270	Hexagonal $\text{P6}_3/\text{mcm}$	55.0	9500	5.5	100	1208
3388	$\text{Sm}_{(2-x)/3}\text{Li}_x\text{TiO}_3$ ( $x=0.5$ )	1350	Perovskite	55.0	2000		-260	1440
3389	$\text{Ca}[(\text{Li}_{1/3}\text{Nb}_{2/3})_{1-x}\text{Ti}_x]\text{O}_{3-\delta}$ ( $x=0.5$ )	1150/3h	Perovskite	55.0	18600		83	752
3390	$0.2\text{PbZrO}_3\text{-}0.8\text{Ca}(\text{Fe}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1250	Perovskite Orthorhombic Pbnm	55.1	450	5.3	-52	1164
3391	$\text{Ba}_4\text{La}_2\text{Ti}_3\text{Nb}_2\text{O}_{18}$	1450/6h	$\text{A}_n\text{B}_{n-1}\text{O}_{3n}$ perovskite Trigonal R-3m	55.1	21270	5.1		1441
3392	$\text{Ca}[(\text{Li}_{1/3}\text{Nb}_{2/3})_{1-x}\text{Ti}_x]\text{O}_3$ ( $x=0.5$ )	1150/3h	Perovskite	55.2	18600		83	752
3393	$\text{CaLa}_4\text{Ti}_5\text{O}_{17}$		Orthorhombic Pnnm	55.2	17400		-20	1272
3394	$(\text{Zn}_{1/3}\text{Ta}_{2/3})_{0.7}\text{Ti}_{0.3}\text{O}_2$	1200		55.3	17500		30	1442
3395	MBRT-90+10 wt% $\text{Li}_2\text{O-B}_2\text{O}_3\text{-SiO}_2\text{-(56.92:37.59)}$	875	Composite	55.3	2500		26	510
3396	$\text{Ba}_3\text{LiNb}_{3-x}\text{Ta}_x\text{Ti}_9\text{O}_{21}$ ( $x=3$ )	1180	Hexagonal $\text{P6}_3/\text{mcm}$	55.6	18500		70	1443
3397	$\text{CaTi}_6(\text{Al}_{1/2}\text{Nb}_{1/2})_4\text{O}_3$	1500/5h	Perovskite Orthorhombic	55.7	21800	7	47	1152
3398	$\text{Sr}_{1-x}\text{Ca}_x\text{La}_4\text{Ti}_5\text{O}_{17}$ ( $x=0.5$ )	1550/6h	Orthorhombic Pnnm	55.8	118000		9	1428
3399	$\text{CaLa}_4\text{Ti}_{4.95}\text{Zr}_{0.05}\text{O}_{17}$	1500/4h	Orthorhombic Pnnm	55.9	15600		5	1444
3400	$\text{Ba}_{6-3x}\text{Sm}_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ )+5 wt% $\text{Bi}_2\text{O}_3\text{-B}_2\text{O}_3$	1050	Tungsten bronze Orthorhombic	56.0	4300		-15	1422
3401	$\text{Ba}_{6-3x}\text{Sm}_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ )+3.5 wt% $\text{Bi}_2\text{O}_3\text{-B}_2\text{O}_3+01\text{LiF}$	1050	Tungsten bronze Orthorhombic	56.0	3900		23	1422

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
3402	0.64BaTi <sub>4</sub> O <sub>9</sub> -0.35BaPr <sub>2</sub> Ti <sub>4</sub> O <sub>19</sub>		Composite	56.0	1000			1445
3403	(Sr <sub>0.1</sub> Ca <sub>0.9</sub> ) <sub>3</sub> Ti <sub>2</sub> O <sub>7</sub>		Orthorhombic Ccm2 <sub>1</sub>	56.0	3000	2.5	141	1358
3404	BaTi <sub>3</sub> Nb <sub>4</sub> O <sub>17</sub>	1310/4h	Orthorhombic Bbmm	56.0	8400	4	86	1401
3405	BaTi <sub>0.95</sub> Ni <sub>0.05</sub> O <sub>3-δ</sub>	1450/2h	Perovskite	56.0	2400			1446
3406	Bi <sub>2</sub> TeO <sub>6</sub> (oxygen atm)	720/15h	Orthorhombic Cmca	56.0	10400		-49	1068
3407	TiFeNbO <sub>6</sub> +4 wt% Bi <sub>2</sub> O <sub>3</sub>	1125/5h	Tetragonal	56.1	1000	3.45	17	1379
3408	Li <sub>1+x-y</sub> Nb <sub>1-x-y</sub> Ti <sub>x+4y</sub> O <sub>3</sub> (x=0.1, y=0.15)	1100/1h	M-Phase	56.2	8350	6	15	1400, 1438
3409	0.5MgTiO <sub>3</sub> -0.5CaTiO <sub>3</sub> -0.25(Nd <sub>2</sub> O <sub>3</sub> -2TiO <sub>2</sub> )		Composite	56.3	23500		68	1383
3410	Ca <sub>0.99</sub> Mg <sub>0.01</sub> La <sub>4</sub> Ti <sub>5</sub> O <sub>17</sub>	1500	Orthorhombic Pnnm	56.3	12300	6.4	-10	1447
3411	Ni <sub>0.5</sub> Ti <sub>0.5</sub> NbO <sub>4</sub> +2 wt% ZnO	930/6h	Tetragonal P4 <sub>2</sub> /mnm	56.3	67000		78	1448
3412	Ca <sub>1-x</sub> Zn <sub>x</sub> La <sub>4</sub> Ti <sub>5</sub> O <sub>17</sub> (x=0)	1500/4h	Orthorhombic Pnnm	56.5	12500	6.6	4	1449
3413	Li <sub>1+x-y</sub> Nb <sub>1-x-3y</sub> Ti <sub>x+4y</sub> O <sub>3</sub> (x=0.1, y=0.1)	1150/10h		56.5	4500		-7	1450
3414	Sr <sub>1-x</sub> Ca <sub>x</sub> La <sub>4</sub> Ti <sub>5</sub> O <sub>17</sub> (x=0.25)	1150/6h	Orthorhombic Pnnm	56.5	10960		39	1428
3415	CaTi <sub>6</sub> (Al <sub>1/2</sub> Nb <sub>1/2</sub> ) <sub>4</sub> O <sub>3</sub> +1 wt% Li <sub>3</sub> NbO <sub>4</sub>	1300/5h	Perovskite Orthorhombic	56.6	28000	7	53	1152
3416	Ba <sub>x</sub> La <sub>4</sub> Ti <sub>3+x</sub> O <sub>12+3x</sub> (x=3)			56.6	13380		-191	1310
3417	Ca <sub>0.97</sub> Mg <sub>0.03</sub> La <sub>4</sub> Ti <sub>5</sub> O <sub>17</sub>	1450	Orthorhombic Pnnm	56.7	10800	5.3	-16	1447
3418	Ni <sub>0.5</sub> Ti <sub>0.5</sub> NbO <sub>4</sub>	1100/6h		56.8	21100		79	1448
3419	0.7CaTiO <sub>3</sub> -0.3Sm(Mg <sub>0.5</sub> Ti <sub>0.5</sub> )O <sub>3</sub>	1550	Composite	57.0	11150	4.1	54	865
3420	La <sub>0.4</sub> Ba <sub>0.6</sub> Ti <sub>0.6</sub> Y <sub>0.4</sub> O <sub>3</sub>	1600/4h		57.0	750		12	1451
3421	Bi <sub>2</sub> O <sub>3</sub> -CaO-Nb <sub>2</sub> O <sub>5</sub> (46.15:23.08:30.77)	950		57.0	470	3.7	24	1452
3422	Ca <sub>1-x</sub> Zn <sub>x</sub> La <sub>4</sub> Ti <sub>5</sub> O <sub>17</sub> (x=0.025)	1500/4h	Orthorhombic Pnnm	57.0	17400	6.7	8	1449
3423	Ca <sub>0.99</sub> Zn <sub>0.01</sub> La <sub>4</sub> Ti <sub>5</sub> O <sub>17</sub> +0.5 wt% CuO	1450	Orthorhombic Pnnm	57.0	15000		-8	1453
3424	CaLa <sub>4</sub> Ti <sub>5</sub> O <sub>17</sub>	1500	Perovskite Pnnm Orthorhombic	57.0	9000		-10	1454
3425	Ba <sub>5</sub> LaTi <sub>2</sub> Nb <sub>3</sub> O <sub>15</sub>	1420/6h	A <sub>n</sub> B <sub>n-1</sub> O <sub>3n</sub> perovskite Trigonal R-3m	57.3	18450	4.7		1441
3426	SrLa <sub>4</sub> Ti <sub>4.9</sub> Zr <sub>0.1</sub> O <sub>12</sub>		Orthorhombic	57.3	9800		70	1455
3427	Pb <sub>0.4</sub> Ca <sub>0.6</sub> (Mg <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>1-x</sub> Sn <sub>x</sub> IO <sub>3</sub> (x=0.05)	1280	Perovskite tetragonal	57.4	8120	5	-4	1424
3428	Ca <sub>1-x</sub> Zn <sub>x</sub> La <sub>4</sub> Ti <sub>5</sub> O <sub>17</sub> (x=0.01)	1450	Orthorhombic Pnnm	57.6	17100		5	1449

3429	$\text{Ba}_{0.7}\text{Ca}_{0.3}(\text{Fe}_{1/2}\text{Nb}_{1/2})\text{O}_3$		Perovskite	57.7	830	7.8	101	1163
3430	$0.85\text{La}_{2/3}\text{TiO}_3\text{-}0.15\text{LaAlO}_3$	1375	Perovskite Orthorhombic	57.7	27900	5.2	65	1096
3431	$(\text{Zn}_{1/3}\text{Nb}_{2/3})_{0.4}(\text{Ti}_{0.7}\text{Sn}_{0.3})_{0.6}\text{O}_2$	1150/3h		57.8	14800		58	1456
3432	$\text{Sr}_3\text{Ti}_2\text{O}_7(\text{Sr}_{n+1}\text{Ti}_n\text{O}_{3n+1})$		Perovskite Tetragonal I4/mmm	57.9	18850	2.5	317	1358
3433	$\text{Sr}_{2.4}\text{Ca}_{0.6}\text{Ti}_2\text{O}_7$	1600	Tetragonal I4/mmm	57.9	25700	2.5	359	1222
3434	$\text{LiNb}_{0.6}\text{Ti}_{0.5}\text{O}_3$ textured		Not available	57.9	6325		-14	1457
3435	$\text{Ba}_{6-3x}\text{Sm}_{8+2x}\text{Ti}_{18}\text{O}_{54}$ (x=2/3)+3.5 wt% $\text{Bi}_2\text{O}_3\text{-B}_2\text{O}_3\text{+}0.5$ wt% LiF	1050	Tungsten bronze Orthorhombic	58.0	4500		6	1422
3436	$(\text{Sr}_{0.8}\text{Ca}_{0.2})_3\text{Ti}_2\text{O}_7$		Tetragonal I4/mmm	58.0	2500	2.5	359	1358
3437	$0.8\text{Ca}_{0.85}\text{Nd}_{0.1}\text{TiO}_3\text{-}0.2\text{SmAlO}_3$	1400	Perovskite	58.0	14000		13	1458
3438	$4\text{CaO-BaO-Nb}_2\text{O}_5\text{-TiO}_2$	1490	Composite	58.0	4000	3.4	44	1307
3439	$\text{Bi}_2\text{O}_3\text{-CaO-Nb}_2\text{O}_5$ (45.75:21.75:32.5)	1050	Composite	58.0	1060	3.8	20	1452
3440	$(1\text{-x})\text{La}_{2/3}\text{TiO}_3\text{-xNiTiO}_3$ (0.075)	1340	Perovskite	58.0	15000	3.4	22	1411
3441	$\text{TiFeNbO}_6\text{+}6$ wt% $\text{Bi}_2\text{O}_3$	1125/5h	Tetragonal	58.1	650	3.32	118	1379
3442	$(\text{Ni}_{1/3}\text{Ta}_{2/3})_{1\text{-x}}\text{Ti}_x\text{O}_2$ (x=0.5)	1300	Rutile Tetragonal P4 <sub>2</sub> /mmm	58.3	13900		86	1276
3443	$\text{Li}_{1+x-y}\text{Nb}_{1-x-y}\text{Ti}_{x+4y}\text{O}_3$ (x=0.05, y=0.1)	1100/1h	M-Phase	58.4	6230	6.3	-31	1400, 1438
3444	$0.3\text{La}(\text{Mg}_{1/2}\text{Ti}_{1/2})\text{O-}0.7\text{CaTiO}_3$	1500	Perovskite Pbnm	58.8	40390	5.5	71	932
3445	$0.8\text{Ca}_{0.85}\text{Nd}_{0.1}\text{TiO}_3\text{-}0.2\text{SmAlO}_3$		Perovskite Orthorhombic	58.9	14600		13	1458
3446	$\text{Li}_{1+x-y}\text{Ta}_{1-x-3y}\text{Ti}_{x+4y}\text{O}_3$ (x=0.1, y=0.1)	1175/1h	M-Phase	58.9	7720		26	1400, 1438
3447	$0.42(\text{La}_{1/2}\text{Na}_{1/2})\text{TiO}_3\text{-}0.58\text{Ca}(\text{Fe}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1300/10h	Complex perovskite Orthorhombic	58.9	14070	6.6	0	1459
3448	$\text{Pb}_{0.4}\text{Ca}_{0.6}(\text{Ni}_{1/3}\text{Nb}_{2/3})\text{O}_3$		Perovskite	59.0	7100	4.2	6	996
3449	$\text{Bi}_{18}\text{Ca}_8\text{Nb}_{12}\text{O}_{65}$	950		59.0	610	3.7	25	1452
3450	$\text{Ca}(\text{Zr}_x\text{Ti}_{1-x})\text{O}_3$ (x=0.5)	1470/15h	Perovskite Orthorhombic Pbnm	59.0	4400	3.14	459	916
3451	$(1\text{-y})\text{Li}_{2.02}\text{Ti}_{0.92}\text{Nb}_{0.06}\text{O}_3$ (y=0.8)	1070		59.1	6900		36	722
3452	$\text{Li}_{1+x-y}\text{Nb}_{1-x-y}\text{Ti}_{x+4y}\text{O}_3$ (x=0.1, y=0.125)	1100/1h	M-Phase	59.2	7560	6	22	1400, 1438
3453	$\text{Ca}_4\text{La}_2\text{Ti}_{5-x}(\text{Mg}_{1/3}\text{Nb}_{2/3})_x\text{O}_{17}$ (x=1)	1540	Orthorhombic Pbnm	59.3	15500		72	1118
3454	$\text{Ba}_{0.8}\text{Ca}_{0.2}(\text{Fe}_{1/2}\text{Nb}_{1/2})\text{O}_3$		Complex Perovskite	59.5	550	6.3	80	1163
3455	$(1\text{-x})\text{La}_{2/3}\text{TiO}_3\text{-xNiTiO}_3$ (0.05)	1360	Perovskite	59.6	14860	3.2	22	1411

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
3456	$\text{Li}_{1+x+y}\text{Ta}_{1-x-3y}\text{Ti}_{x+4y}\text{O}_3$ ( $x=0.15$ , $y=0.1$ )	1175/1h	M-Phase	59.6	9100		42	1400, 1438
3457	$\text{Pb}_{0.25}\text{Ca}_{0.75}[(\text{Mg}_{1/3}\text{Nb}_{2/3})_{0.75}\text{Ti}_{0.25}]\text{O}_3$		Perovskite	60.0	11000		0	1460
3458	$\text{Ba}(\text{Ti}_{0.85}\text{Mn}_{0.15})\text{O}_3$	1400	Perovskite	60.0	12000		225	1461
3459	$\text{BaSm}_2\text{Ti}_4\text{O}_{12}+16$ mol% $\text{BaCuB}_2\text{O}_5$	875	Tungsten-Bronze Orthorhombic	60.0	4500		-30	1462
3460	$\text{Ba}_4\text{Sm}_{9.33}\text{Ti}_{18}\text{O}_{54}+8$ wt% $\text{BaCu}(\text{B}_2\text{O}_5)$	1050	Tungsten Bronze Orthorhombic	60.0	4100		-26	1391
3461	$(\text{Sr}_{0.2}\text{Ca}_{0.8})_3\text{Ti}_2\text{O}_7$		Orthorhombic Ccm2 <sub>1</sub>	60.0	2630	2.5	232	1358
3462	$0.5\text{CaTiO}_3-0.5\text{Sr}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$	1600	Perovskite	60.0	14000		60	1347
3463	$\text{BaNd}_2\text{Ti}_3\text{O}_{10}$		Tungsten bronze	60.0	5300	4.2	140	1463
3464	$\text{Ca}_2\text{Sr}_3\text{Nb}_2\text{TiO}_{12}$	1530	Orthorhombic	60.0	6000	3.5	48	1209
3465	$(\text{Ca}_{1-x}\text{Nd}_{2x/3})\text{TiO}_3$ ( $x=0.3$ )+25 vol% $3\text{ZnO}-2\text{B}_2\text{O}_3$	900	Perovskite	60.0	3700		62	1004
3466	$\text{Ba}_3\text{LiNb}_2\text{Sb}_3\text{Ti}_5\text{O}_{21}$	1140		60.0	14000		143	923
3467	$\text{Ca}[\text{Ti}_{0.4}(\text{Mg}_{1/3}\text{Ta}_{2/3})_{0.6}]\text{O}_3$	1350	Perovskite Orthorhombic	60.2	36900		-10	1464
3468	$\text{Ba}_3\text{LiNb}_{3-x}\text{Ta}_x\text{Ti}_9\text{O}_{21}$ ( $x=2$ )		Hexagonal P6 <sub>3</sub> /mcm	60.3	15100		100	1443
3469	$\text{Li}_{1+x+y}\text{Ta}_{1-x-3y}\text{Ti}_{x+4y}\text{O}_3$ ( $x=0.1$ , $y=0.075$ )	1175/1h	M-Phase	60.5	5014		-5	1399, 1400
3470	$7\text{NiNb}_2\text{O}_6-9\text{TiO}_2+3.2$ wt% CuO	935	Composite	60.5	1040		62	1465
3471	$0.42(\text{La}_{1/2}\text{Na}_{1/2})\text{TiO}_3-$ $0.58\text{Ca}(\text{Fe}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1350/10h	Complex perovskite Orthorhombic	60.6	1300	6.6	6.5	1459
3472	$\text{Nd}_{0.5}\text{Ti}_{0.5}\text{NbO}_4$	1140/6h	Tetragonal P4 <sub>2</sub> /mnm	60.6	70100		76	1448
3473	$\text{Ba}(\text{Pr}_{0.3}\text{Bi}_{0.2}\text{Nb}_{0.5})\text{O}_3$	1300	Perovskite	60.7	1500		15	1341
3474	$\text{Sr}_{1-x}\text{Ca}_x\text{La}_4\text{Ti}_5\text{O}_{17}$ ( $x=0$ )	1500/6h	Orthorhombic Pnnm	60.8	9970		117	1428
3475	$0.5\text{BaTiO}_3-0.5\text{La}(\text{Mg}_{1/2}\text{Ti}_{1/2})\text{O}_3$		Perovskite I4/mcm	60.9	9600	5.2	-2	933
3476	$\text{Ca}_2\text{Ba}_3\text{Ta}_2\text{TiO}_{12}$	1525	Cubic perovskite	61.0	1800	3.4	21	1307
3477	$0.2\text{Li}_2\text{O}-0.62\text{Nb}_2\text{O}_5-0.17\text{TiO}_2$	1350		61.0	15000		100	760
3478	$x(\text{Ba}_4\text{Nd}_{9.33}\text{Ti}_{18}\text{O}_{54})-(1-x)\text{BaLa}_4\text{Ti}_4\text{O}_{15}$ ( $x=0.75$ )+ $\text{Bi}_2\text{O}_3-\text{B}_2\text{O}_3-\text{ZnO}-\text{SiO}_2$ glass	1140	Composite	61.0	2300		38	1466
3479	$\text{Ba}_4(\text{Sm}_{0.5}\text{Nd}_{0.5})_{28/3}\text{Ti}_{18}\text{O}_{54}+2$ mol% $\text{TiO}_2+2$ wt% $\text{Li}_2\text{O}-\text{Al}_2\text{O}_3-\text{B}_2\text{O}_3$ glass		Tungsten Bronze Orthorhombic	61.1	5900		17	1467

3480	CoTiNb <sub>2</sub> O <sub>8</sub> +2 wt% CuO	950	Tetragonal rutile P42/mnm	61.5	15900		42	1468
3481	MBRT-90+10 wt% Li <sub>2</sub> O-B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -CaO-Al <sub>2</sub> O <sub>3</sub> (52.45::31.06:11.99:2:2.5)	875	Composite	61.6	2500		18	510
3482	(Pb <sub>0.4</sub> Ca <sub>0.6</sub> )(Fe <sub>1/2</sub> Ta <sub>1/2</sub> )O <sub>3</sub>	1050/3h	Complex perovskite cubic Pm3m	62.0	9000		-15	1469
3483	0.83Bi <sub>2</sub> O <sub>3</sub> -0.25Nb <sub>2</sub> O <sub>5</sub>	900/3h	Flourite Fm-3m	62.0	560		-372	1396
3484	CaSr <sub>4</sub> Nb <sub>2</sub> TiO <sub>12</sub>	1530		62.0	11500	3.4	51	1209
3485	Li <sub>1+x+y</sub> Ta <sub>1-x-3y</sub> Ti <sub>x+4y</sub> O <sub>3</sub> (x=0.15, y=0.075)	1175/1h	M- Phase	62.1	6190		13	1399, 1400
3486	Li <sub>1+x-y</sub> Nb <sub>1-x-y</sub> Ti <sub>x+4y</sub> O <sub>3</sub> (x=0.1, y=0.05)	1100/1h	M-Phase	62.4	3750	6.	-53	1399, 1400
3487	Ba <sub>0.725</sub> Ca <sub>0.275</sub> (Fe <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>		Perovskite	62.4	640	6.3	82	1163
3488	Ni <sub>0.3</sub> Zn <sub>0.2</sub> Ti <sub>0.5</sub> NbO <sub>4</sub>	1120		62.5	13500	TCF65		1470
3489	0.9La <sub>2/3</sub> TiO <sub>3</sub> -0.1LaAlO <sub>3</sub>	1350	Perovskite Orthorhombic	62.6	26100	4.9	82	1096
3490	Ca[Ti <sub>1-x</sub> (Mg <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>x</sub> ]O <sub>3</sub> (x=0.4)	14504h	Perovskite	62.9	12200		92	1271
3491	Pb <sub>0.4</sub> Ca <sub>0.6</sub> (Mg <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>1-x</sub> Sn <sub>x</sub> O <sub>3</sub> (x=0.03)	1280	Perovskite Tetragonal	63.0	7540	5	-4	1424
3492	Ba <sub>6-3x</sub> Sm <sub>8+2x</sub> Ti <sub>18</sub> O <sub>54</sub> (x=2/3)+3 wt% Bi <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub>	1100	Tungsten Bronze	63.0	8500		-19	1422
3493	(1-x)BaLa <sub>4</sub> Ti <sub>4</sub> O <sub>15</sub> -xBa <sub>4</sub> Nd <sub>9.333</sub> Ti <sub>18</sub> O <sub>54</sub> (x=0.55)		Composite	63.0	10000		-20	1471
3494	0.9La <sub>2/3</sub> TiO <sub>3</sub> -0.1LaAlO <sub>3</sub>	1350	Perovskite	63.0	26100		82	1096
3495	Bi <sub>2</sub> Zn <sub>2/3</sub> Ta <sub>4/3</sub> O <sub>7</sub> +0.05 wt% CuO+0.05 wt% V <sub>2</sub> O <sub>5</sub>	930		63.0	6800	5.35		1472
3496	Ba <sub>3</sub> La <sub>4</sub> Ti <sub>6</sub> O <sub>21</sub>			63.0	9100		198	1473
3497	(1-x)La <sub>2/3</sub> TiO <sub>3</sub> -xNiTiO <sub>3</sub> (x=0.02)	1380	Perovskite	63.3	6210	3.3	22	1411
3498	0.4Ba(Mg <sub>1/2</sub> W <sub>1/2</sub> )O <sub>3</sub> -0.6BaTiO <sub>3</sub>	1500/6h	Perovskite Hexagonal	63.9	3800		303	373
3499	CaBa <sub>4</sub> Ta <sub>2</sub> TiO <sub>12</sub>	1500	Cubic perovskite	64.0	1400	3.6	24	1307
3500	Pb <sub>2</sub> Ta <sub>1.5</sub> Nb <sub>0.5</sub> O <sub>7</sub>		Hexagonal	64.0	12800		223	1474
3501	Ba <sub>6-3x</sub> Sm <sub>8+2x</sub> Ti <sub>18</sub> O <sub>54</sub> x <sub>2/3</sub> +3 wt% Al <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub>	1175	Tungsten Bronze Orthorhombic	64.0	8500	-	0	1475

(continued)



No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
3502	$\text{Li}_{1+x-y}\text{Nb}_{1-x-y}\text{Ti}_{x+4y}\text{O}_3$ ( $x=0.15$ , $y=0.075$ )	1100/1h	M-phase	64.0	4610	5.9	-15	1438
3503	$\text{Co}_{0.5}\text{Ti}_{0.5}\text{NbO}_4$	1120	Tetragonal $\text{P4}_2/\text{mmn}$	64.0	65300		223	1179
3504	$0.84\text{CaTiO}_3-0.16\text{Sm}_{0.9}\text{Nd}_{0.1}\text{AlO}_3+0.4$ wt% MgO	1375/3h		64.2	30900		26	1476
3505	$\text{Pb}_{.4}\text{Ca}_{.6}(\text{Mg}_{1/3}\text{Nb}_{2/3})_{1-x}\text{Sn}_x\text{O}_3$ ( $x=0.01$ )	1280	Perovskite Tetragonal	64.7	7130	5	0	1424
3506	$\text{LiNb}_{0.6}\text{Ti}_{0.5}\text{O}_3+0.5$ wt% 0.17 $\text{Li}_2\text{O}-0.83\text{V}_2\text{O}_5$	850		64.7	5900		9	1450
3507	$\text{Li}_{1+x-y}\text{Nb}_{1-x-y}\text{Ti}_{x+4y}\text{O}_3$ ( $x=0.1$ , $y=0.1$ )	1100/1h	M-Phase	64.8	6385	5.7	8	1399, 1400
3508	$\text{La}_{2/3}\text{TiO}_3$		Perovskite Orthorhombic Pbnm	65.0	15700			1477
3509	$\text{La}_{0.4}\text{Ba}_{0.6}\text{Ti}_{0.6}\text{Yb}_{0.4}\text{O}_3$	1600/4h	Not available	65.0	4500		1	1451
3510	$\text{Ba}_3\text{Ti}_4\text{Nb}_4\text{O}_{21}+3$ wt% CuO+1 wt% $\text{B}_2\text{O}_3$	900/2h	Hexagonal $\text{P6}_3/\text{mcm}$	65.0	16000		101	1478
3511	$\text{Ba}_4(\text{Nd}_{0.85}\text{Bi}_{0.015})_{9.33}\text{Ti}_{18}\text{O}_{54}+30$ wt% $\text{Li}_2\text{O}-\text{ZnO}-\text{B}_2\text{O}_3$	875	Composite	65.0	2500	5.5	35	1479
3512	$(\text{Pb}_{0.4}\text{Ca}_{0.6})[(\text{Mg}_{1/2}\text{Nb}_{1/2})\text{O}_3\text{Sn}_x]$ ( $x=0.01$ )	1350	Perovskite	65.0	7100		136	1424
3513	$\text{Ba}_4\text{Sm}_{9.33}\text{Ti}_{18}\text{O}_{54}+6$ wt% BaCu( $\text{B}_2\text{O}_5$ )	1075	Orthorhombic	65.0	4200		-24	1391
3514	$\text{Ba}[\text{Ti}_{1-x}(\text{Co}_{0.5}\text{W}_{0.5})_x\text{O}_3]$ ( $x=0.4$ )		Perovskite	65.0	3000		45	519
3515	$0.1\text{Pb}(\text{Fe}_{2/3}\text{W}_{1/3})\text{O}_3-$ $0.9\text{Pb}_{0.2}\text{Ca}_{0.8}(\text{Fe}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1000	Perovskite	65.3	2270		-24	1480
3516	$\text{CaTi}_{0.7}(\text{Al}_{1/2}\text{Ta}_{1/2})_{0.3}\text{O}_3$	1500/15h	Perovskite Orthorhombic	65.4	20000	8	113	1266
3517	$\text{CaTi}_{0.7}(\text{Al}_{1/2}\text{Nb}_{1/2})_{0.3}\text{O}_3$	1450/5h	Perovskite Orthorhombic	65.4	19300	7	-2	1152
3518	$0.5\text{CeO}_2-0.25\text{CaO}-0.25\text{TiO}_2$	1550	Mixture phases	65.5	9500	3.2	399	488
3519	$\text{Ca}_3\text{Ba}_2\text{Nb}_2\text{TiO}_{12}$	1475	Cubic perovskite	66.0	2600	3.3	48	1307
3520	$(1-x)(\text{Mg}_{0.95}\text{Zn}_{0.05})\text{TiO}_3-x\text{Ca}_{0.6}\text{La}_{0.8/3}\text{TiO}_3$ ( $x=0.7$ )	1320/4h	Composite	66.0	39000		168	465
3521	$\text{BaTi}_{0.4}\text{Ca}_{0.3}\text{Nb}_{0.3}\text{O}_3$	1500/4h	Perovskite Tetragonal $\text{P4mm}$	66.0	3720	4.7		1373
3522	$\text{LiNb}_{0.6}\text{Ti}_{0.5}\text{O}_3+2$ wt% $\text{V}_2\text{O}_5$	900/1h	M-Phase	66.0	3800	5.6	11	1450
3523	$\text{Bi}_2\text{O}_3-\text{CaO}-\text{Nb}_2\text{O}_5$ (52.5:17.5:30)	925		66.0	330	3.6	35	1452
3524	$\text{Ba}_3\text{Ti}_4\text{Nb}_4\text{O}_{21}+0.2\text{MnCO}_3-0.8\text{CuO}$	950	Hexagonal $\text{P6}_3/\text{mcm}$	66.0	13400		60	1481
3525	$\text{LiNb}_{0.6}\text{Ti}_{0.5}\text{O}_3+1$ wt% LBS glass	900	Rhombohedral	66.2	5200	4.3	19	1482

3526	$\text{Pb}_{0.4}\text{Ca}_{0.6}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$	1280	Perovskite Tetragonal	66.3	6940	5	3	1424
3527	$\text{Bi}_2(\text{Zn}_{1/3}\text{Ta}_{2/3})_2\text{O}_7$	850	Cubic Fd3m	66.3	6200		-9	1472
3528	$(\text{Ni}_{1/3}\text{Ta}_{2/3})_{1-x}\text{Ti}_x\text{O}_2$ (x=0.6)	1300	Rutile Tetragonal P4 <sub>2</sub> /mmm	66.4	2180		147	1276
3529	$\text{Ba}_{4.2}\text{Nd}_{9.2}\text{Ti}_{18}\text{O}_{54}+13 \text{ wt}\%$ $\text{NdAlO}_3+0.3 \text{ wt}\% \text{ MnO}_2$	1380/2h	Tungsten Bronze	66.5	14000		0	1483
3530	$0.92\text{La}_{2/3}\text{TiO}_3-0.08\text{LaAlO}_3$	1350	Perovskite Orthorhombic	66.9	28350	4.8	82	1096
3531	$(\text{Ba}_{4.2}\text{Sm}_{9.2})\text{Ti}_{16.6}\text{Al}_{1.4}\text{O}_{54}$	1440	Tungsten Bronze	67.0	1543	5.4	-90	1484
3532	$\text{BaNd}_2\text{Ti}_4\text{O}_{12}+\text{B}_2\text{O}_3-\text{Bi}_2\text{O}_3-\text{SiO}_2-\text{ZnO}$ glass+ $\text{La}_2\text{O}_3-\text{B}_2\text{O}_3-\text{TiO}_2$	900	Tungsten Bronze	67.0	6000	6	4	1485
3533	$(\text{Ca}_{0.3}\text{Li}_{0.14}\text{Sm}_{0.42})\text{TiO}_3-\text{Mg}_{0.93}\text{Ca}_{0.07}\text{TiO}_3$ stacked layers	1350	Stacked layers	67.2	7900		0	719
3534	$\text{ZrTe}_3\text{O}_8$	760/15h	Cubic Ia3	67.5	1800	4	362	53, 62
3535	$\text{CaTi}_{0.7}(\text{Al}_{1/2}\text{Nb}_{1/2})_{0.3}\text{O}_3$	1500/5h	Perovskite	67.8	18700		138	1152
3536	$0.8\text{CaTiO}_3-0.2\text{Sm}(\text{Mg}_{0.5}\text{Ti}_{0.5})\text{O}_3$	1550	Perovskite	68.0	12400	3.5	147	865
3537	$\text{Ba}_{6-3x}(\text{Sm}_{1-y}\text{Nd}_y)_{8+2x}(\text{Ti}_{1-z}\text{Sn}_z)\text{O}_{54}$ (x=2/3, y=0, z=0.1)		Tungsten bronze	68.0	4020		20	1486
3538	$0.6\text{CaTiO}_3-0.4\text{Ca}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$	1450	Perovskite	68.0	17000	5.4	108	944
3539	$\text{BiVO}_4$	900	Monoclinic I2/b	68.0	8000		-243	1487
3540	$0.3\text{La}(\text{Mg}_{1/2}\text{Ti}_{1/2})\text{O}_3-0.7\text{SrTiO}_3$		Perovskite Imma	68.4	4950	6.6		978
3541	$(\text{Pb}_{1-x}\text{Ca}_x)[\text{Fe}_{1/2}\text{Nb}_{1/2}1_{1-y}\text{Zr}_y]\text{O}_3$ (y=0.01, x=0.6)	1150	Perovskite	68.7	6800	4.2	-17	1488
3542	$(\text{Ni}_{1/3}\text{Nb}_{2/3})_{1-x}\text{Ti}_x\text{O}_2$ (x=0.3)	1200	Rutile Tetragonal P4 <sub>2</sub> /mmm	68.7	19300		57	1276
3543	$(\text{Ca}_{0.2}\text{Sr}_{0.8})_3\text{Ti}_2\text{O}_7$	1460/2h	Tetragonal I4/mmm	68.8	10600			1489
3544	$\text{Ba}_4(\text{Sm}_{0.5}\text{Nd}_{0.5})_{28/3}\text{Ti}_{18}\text{O}_{54}+2\text{TiO}_2+5$ wt% $\text{K}_2\text{O}-\text{B}_2\text{O}_3-\text{SiO}_2$ glass	1075/3h	Orthorhombic Tungsten Bronze	68.8	6800		29	1490
3545	$\text{Ba}_4\text{Gd}_9\text{Ti}_{18}\text{O}_{54}$	1350/10h	Orthorhombic Pbam	69.0	3300	1	-60	1491
3546	$\text{CaTi}_{0.7}(\text{Al}_{1/2}\text{Nb}_{1/2})_{0.3}\text{O}_3+1 \text{ wt}\%$ $\text{Li}_3\text{NbO}_4$	1300/5h	Perovskite Orthorhombic	69.0	21500	7	145	1152
3547	$(1-x)\text{La}_{2/3}\text{TiO}_3-x\text{NiTiO}_3$ (0.03)	1375	Perovskite	69.4	16960	3.1	18	1411
3548	$\text{Ba}_{2-x}\text{Sm}_{(4+2/3x)}\text{Ti}_9\text{O}_{26}$ (x=0.3)	1360/4h	Tunsten Bronze	69.4	9700		6	1493
3549	$(\text{Ba}_{4.2}\text{Sm}_{9.2})_a\text{Ti}_{17}\text{AlO}_{54}$	1440	Tungsten Bronze	70.0	4360	5.22	-57	1484

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
3550	$\text{LiNb}_{0.6}\text{Ti}_{0.5}\text{O}_3 + 1 \text{ wt}\% \text{ ZnO-B}_2\text{O}_3$	900	M phase solid solution	70.0	5900		-5	1493
3551	$\text{Ba}_4\text{Nd}_{9.33}\text{Ti}_{18}\text{O}_{54} + 2 \text{ wt}\% \text{ Al}_2\text{O}_3$	1320/4h	Tungsten Bronze	70.0	12200		20	1494
3552	$\text{Ba}_{6-3x}\text{Sm}_{8+2x}\text{Ti}_{18}\text{O}_{54} (x=2/3) + 1 \text{ wt}\% \text{ Bi}_2\text{O}_3\text{-B}_2\text{O}_3$	1200	Tungsten Bronze	70.0	8500		-13	1422
3553	$\text{Bi}_2(\text{Zn}_{1/3}\text{Nb}_{2/3})_2\text{O}_7 + 1 \text{ wt}\% \text{ of } 0.15\text{CuO-0.85MoO}_3$	900		70.0	4800	3		1495
3554	$\text{Ba}_{6-3x}\text{Sm}_{8+2x}\text{Ti}_{18}\text{O}_{54} (x=2/3) + 0.5 \text{ wt}\% (50\text{Al}_2\text{O}_3\text{-}50\text{SiO}_2)$	1220	Tungsten Bronze	70.0	8500	-	-21	1475
3555	$\text{Ba}_4\text{Sm}_{9.33}\text{Ti}_{18}\text{O}_{54} + 4 \text{ wt}\% \text{ BaCu}(\text{B}_2\text{O}_5)$	1175	Tungsten Bronze	70.0	4700		-16	1391
3556	$0.97\text{La}_{2/3}\text{TiO}_3\text{-}0.03\text{NiTiO}_3$	1350		70.0	17000		18	1411
3557	$\text{Ba}_{6-3x}\text{Sm}_{8+2x}\text{Ti}_{18}\text{O}_{54} (x=2/3) + 0.5 \text{ wt}\% (44\text{Al}_2\text{O}_3\text{-}30\text{B}_2\text{O}_3\text{-}26\text{SiO}_2)$	1220	Tungsten Bronze	70.0	8600	-	-12	1475
3558	$\text{LiNb}_{0.6}\text{Ti}_{0.5}\text{O}_3 + 1 \text{ wt}\% \text{ B}_2\text{O}_3$	880		70.0	5400		-6	1496
3559	$(\text{Ba}_{4.2}\text{Sm}_{9.2})_\alpha\text{Ti}_{18-y}\text{Al}_y\text{O}_{54} (y=1, \alpha=1+y/36, x=0.6)$	1440	Tungsten Bronze	70.2	4350		-57	1484
3560	$\text{Pb}_{0.4}\text{Ca}_6[(\text{Fe}_{1/2}\text{Nb}_{1/2})_{0.9}\text{Sn}_{0.1}\text{O}_3]$	1150/3h	Perovskite Orthorhombic	70.3	8200		-19	1497
3561	$0.1\text{CaTiO}_3\text{-}0.5(\text{Li}_{1/2}\text{Nd}_{1/2})\text{TiO}_3\text{-}0.4(\text{Dy}_{1/3}\text{Nd}_{1/3})\text{TiO}_3$	1350/3h	Tetragonal P-4b2 Perovskite	70.6	1470		-156	1498
3562	$\text{Ba}_{6-3x}\text{Sm}_{8+2x}\text{Ti}_{18}\text{O}_{54} (x=2/3) + 0.5 \text{ wt}\% (22\text{MgO-}22\text{Al}_2\text{O}_3\text{-}56\text{SiO}_2)$	1200	Tungsten Bronze	71.0	5890	-	-19	1475
3563	$\text{Ba}_{6-3x}\text{Sm}_{8+2x}\text{Ti}_{18}\text{O}_{54} (x=2/3) + 0.5 \text{ wt}\% (35\text{Bi}_2\text{O}_3\text{-}32\text{ZnO-}6\text{SiO}_2\text{-}27\text{B}_2\text{O}_3)$	1200	Tungsten Bronze Perovskite	71.0	8900	-	-10	1475
3564	$0.14(\text{BaO-Nd}_2\text{O}_3\text{-}4\text{TiO}_2)\text{-}0.86(\text{BaO-Al}_2\text{O}_3\text{-}4\text{TiO}_2)$			71.0	8200	-	0	1111
3565	$\text{Ba}\{\text{Ti}_{0.95}\text{Mn}_{0.05}\}\text{O}_{3-\delta}$	1450/2h	Perovskite	71.1	7700	4.8		1446
3566	$\text{Ba}[\text{Ti}_{1-x}(\text{Zn}_{1/2}\text{W}_{1/2})_x]\text{O}_3 (x=0.4)$	1420	Cubic perovskite Pm3-m	71.2	4800		48	695
3567	$\text{Cu}_{0.5}\text{Ti}_{0.5}\text{NbO}_4$	960/6h	Tetragonal rutle	71.2	11000		49	1499
3568	$\text{SrO-}2\text{CeO}_2\text{-}4\text{TiO}_2$	1330/3h	Tetragonal	71.3	10400		187	1500
3569	$0.2\text{Pb}(\text{Fe}_{2/3}\text{W}_{1/3})\text{O}_3\text{-}0.8\text{Pb}_{0.2}\text{Ca}_{0.8}(\text{Fe}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1000	Perovskite	71.4	1520		-29	1480
3570	$\text{Ba}_{(2-x)}\text{Sm}_{(4+2/3x)}\text{Ti}_9\text{O}_{24} (x=0.25)$	1370		71.5	10700	5.1	4	1501

3571	$\text{Ca}_{0.66}\text{La}_{0.387}\text{Ti}_{0.88}\text{O}_3$	1550	Orthorhombic Pbnm	71.5	13400		136	1502
3572	$0.2\text{Ca}_{0.8}\text{Sr}_{0.2}\text{TiO}_3-0.8\text{Li}_{0.5}\text{Sm}_{0.5}\text{TiO}_3+5$ wt% $\text{BaCu}(\text{B}_2\text{O}_5)+1.5$ wt% $\text{TiO}_2$	950		71.6	3400		-11	1503
3573	$\text{SrO}-2\text{CeO}_2-5\text{TiO}_2$	1330/3h	Mixed phases	71.7	6670		203	1500
3574	$\text{LiNb}_{0.63}\text{Ti}_{0.4625}\text{O}_3+0.1$ wt% $\text{B}_2\text{O}_3-\text{SiO}_2$	900		71.7	4950		-2	1504
3575	$(1-x)\text{Ca}_{0.61}\text{Nd}_{0.26}\text{TiO}_3-$ $x\text{Nd}(\text{Zn}_{0.5}\text{Ti}_{0.5})\text{O}_3+x=0.2$	1300	Perovskite	71.8	17300		94	1505
3576	$0.92\text{BiVO}_4-0.08\text{Li}_{0.5}\text{Nd}_{0.5}\text{WO}_4$	750	Monoclinic	71.8	7500		1	1506
3577	$0.96\text{La}_{2/3}\text{TiO}_3-0.04\text{LaAlO}_3$	1325	Perovskite Orthorhombic	71.9	23900	4.5	123	1096
3578	$\text{Pb}_{0.5}\text{Ca}_{0.5}(\text{Na}_{1/4}\text{Nb}_{3/4})\text{O}_3$		Perovskite	72.0	1500	3.5	230	996
3579	$\text{Ba}_4\text{Sm}_{9.33}\text{Ti}_{18}\text{O}_{54}+2$ wt% $\text{BaCu}(\text{B}_2\text{O}_5)$	1175	Orthorhombic	72.0	5500		-14	1391
3580	$\text{Pb}_{0.5}\text{Ca}_{0.5}(\text{Zr}_{0.95}\text{Ti}_{0.05})\text{O}_3$	1350	Perovskite Rhombohedral	72.0	4100	4	2	1507
3581	$0.96\text{La}_{2/3}\text{TiO}_3-0.04\text{LaAlO}_3$	1325	Perovskite	72.0	24000		123	1096
3582	$\text{Ba}_{6-3x}\text{Sm}_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ )+0.5 wt% (60ZnO-30B <sub>2</sub> O <sub>3</sub> -10SiO <sub>2</sub> )	1200	Tungsten-bronze Orthorhombic	72.0	4530	-	-17	1475
3583	$\text{Ba}_{6-3x}\text{Sm}_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ )+0.5 wt% (40MgO-40B <sub>2</sub> O <sub>3</sub> -20SiO <sub>2</sub> )	1200	Tungsten-Bronze Orthorhombic	72.0	4450	-	-16	1475
3584	$\text{Ba}_{6-3x}\text{Sm}_{8+2x}\text{Ti}_{18}\text{O}_{54}-1.9\text{TiO}_2$ ( $x=2/3$ )	1350/2h	Tungsten Bronze	72.0	10300		7.2	1508
3585	$(\text{Ba}_{4.2}\text{Sm}_{9.2})_\alpha\text{Ti}_{18-y}\text{Al}_y\text{O}_{54}$ ( $y=0.8$ , $\alpha=1+y/36$ , $x=0.6$ )	1440	Orthorhombic Tungsten Bronze	72.1	4600		-42	1484
3586	$(1-x)\text{CaTiO}_3-x\text{Sm}(\text{Mg}_{1/2}\text{Ti}_{1/2})\text{O}_3$ ( $x=0.2$ )		Orthorhombic Pnma	72.0	12000		160	1008
3587	$\text{Pb}_{0.5}\text{Ca}_{0.5}(\text{Ni}_{1/3}\text{Nb}_{2/3})\text{O}_3$		Perovskite	73.0	5100	3.5	52	996
3588	$\text{Pb}_{0.4}\text{Ca}_{0.6}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$		Perovskite	73.0	4100	3.1	3.7	996
3589	$\text{Ba}_{6-3x}\text{Sm}_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ )+0.5 wt% (71ZnO- 29B <sub>2</sub> O <sub>3</sub> )	1200	Tungsten-Bronze Orthorhombic	73.0	4830	-	-14	1475
3590	$(\text{Pb}_{0.5}\text{Ni}_{0.5})(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$		Perovskite	73.0	4900		52	996
3591	$\text{Ba}_{6-3x}\text{Sm}_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ )+0.5 wt% (40 B <sub>2</sub> O <sub>3</sub> - 60SiO <sub>2</sub> )	1200	Tungsten-Bronze Orthorhombic	73.0	7900	-	-16	1475
3592	$\text{Ba}_{6-3x}\text{Sm}_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ )+0.5 wt% B <sub>2</sub> O <sub>3</sub>	1220	Tungsten Bronze Orthorhombic	73.0	9500	-	-14	1475
3593	$\text{Ba}_{0.98}\text{Sr}_{0.02}\text{Sm}_2\text{Ti}_4\text{O}_{12}$	1375/6	Tungsten Bronze	73.0	7920		-6	1509

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
3594	$\text{Ca}_4\text{La}_2\text{Ti}_5\text{O}_{17}$	1550/4h	Cubic perovskite	73.0	16000	3.3	127	1118, 1510
3595	$\text{Ba}_3\text{LiNb}_{3-x}\text{Ta}_x\text{Ti}_5\text{O}_{21}$ (x=1)			73.0	13600		172	1443
3596	$\text{Ba}_{6-3x}\text{Nd}_{8+2x}\text{Ti}_{18}\text{O}_{54}$ (x=2/3)+2 wt% $\text{H}_3\text{BO}_3$ -TEOS	1075	Tungsten-Bronze Orthorhombic	73.8	8200		47	1511
3597	$\text{Ba}_4\text{Nd}_{3.33}\text{Eu}_6\text{Ti}_{18}\text{O}_{54}$	1460	Tungsten-Bronze	73.9	8900		-11	1512
3598	$\text{Ca}_{0.8}\text{Sr}_{0.2}\text{TiO}_3$ - $\text{Li}_{0.5}\text{Sm}_{0.5}\text{TiO}_3$ +x wt% $[\text{YB}_2\text{O}_3-(1-y)\text{CuO}]$ (x=7.5, y=0.5)	950		74.0	2500		1	1513
3599	$\text{BaTi}_{0.95}\text{Co}_{0.05}\text{O}_{3-\delta}$	1450/2h	Perovskite	74.0	1300			1446
3600	$\text{Pb}_{0.5}\text{Ca}_{0.5}\text{ZrO}_3$	1500	Perovskite	74.0	3900	3.7	-17	1514
3601	$\text{Ba}_{6-3x}\text{Sm}_{8+2x}\text{Ti}_{18}\text{O}_{54}$ (x=2/3)+0.5 wt% (50ZnO- 50B <sub>2</sub> O <sub>3</sub> )	1220	Tungsten bronze	74.0	5330	-	-17	1475
3602	$\text{Ba}_{6-3x}\text{Sm}_{8+2x}\text{Ti}_{18}\text{O}_{54}$ (x=2/3)+0.5 wt% (30 BaO- 40B <sub>2</sub> O <sub>3</sub> +30SiO <sub>2</sub> )	1220	Tungsten Bronze Orthorhombic	74.0	9700	-	-12	1475
3603	TiO <sub>2</sub> +zinc borosilicate glass	900	Composite	74.0	8000		340	1515
3604	$0.88\text{TiO}_2$ - $0.12\text{Bi}_2\text{Ti}_4\text{O}_{11}$	1200	composite	74.0	9500		3	1372
3605	$\text{BaO-Sm}_2\text{O}_3$ -TiO <sub>2</sub>		Tungsten Bronze	74.0	12000		10	1516
3606	$\text{BaTi}_{0.92}\text{Ga}_{0.08}\text{O}_{2.96}$	1450	Tetragonal Perovskite	74.0	7810	5.5		1517
3607	$0.7\text{Ca}_{0.6}\text{La}_{0.267}\text{TiO}_3$ - $0.3\text{Ca}(\text{Sm}_{0.5}\text{Nb}_{0.5})\text{O}_3$		Perovskite	74.3	12700		9	1518
3608	$\text{Ba}_4(\text{Sm}_{0.5}\text{Nd}_{0.5})_{28/3}\text{Ti}_{18+x}\text{O}_{54}$ -2TiO <sub>2</sub> +2 2x+1.5 wt% Al <sub>2</sub> O <sub>3</sub>	1260/5h	Mixture	74.3	11900		5	1519
3609	$\text{Ba}_{(2-x)}\text{Sm}_{(4+2/3x)}\text{Ti}_9\text{O}_{28}$ (x=0.2)	1370		74.8	10900	5.78	2	1501
3610	$\text{Ca}_2\text{Ba}_3\text{Nb}_2\text{TiO}_{12}$	1500	Cubic perovskite	75.0	1600	3.04	53	1307
3611	$\text{Ba}_{6-3x}\text{Sm}_{8+2x}\text{Ti}_{18}\text{O}_{54}$ (x=2/3)+0.5 wt% (40PbO-40B <sub>2</sub> O <sub>3</sub> -20SiO <sub>2</sub> )	1200	Tungsten-Bronze Orthorhombic	75.0	6500	-	-17	1475
3612	$(\text{Pb}_{0.5}\text{Co}_{0.5})(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$		Perovskite	75.0	1400		16	996
3613	$(\text{Bi}_{1.92}\text{Zn}_{0.08})(\text{Zn}_{0.64}\text{Nb}_{1.36})\text{O}_7$	1000	Pyrochlore-Monoclinic	75.0	1800			1520
3614	$\text{Ba}_{.98}\text{Sr}_{0.02.2}\text{Sm}_2\text{Ti}_4\text{O}_{12}$		Tungsten Bronze	75.0	7920		-6	1509
3615	$\text{Pb}_{0.5}\text{Ca}_{0.5}(\text{Co}_{1/3}\text{Nb}_{2/3})\text{O}_3$		Perovskite	75.0	1450	3.7	16	996
3616	$\text{Li}_{1/2}\text{Nd}_{1/2}\text{TiO}_3$		Perovskite	75.0	2000		-274	1498

3617	$0.6(\text{Sm}_{1/2}\text{Li}_{1/2})\text{TiO}_3\text{-}0.4(\text{Sm}_{1/2}\text{Na}_{1/2}\text{Ti})\text{O}_3$	1350		75.0	2000	10		1521
3618	$\text{Ni}_{0.15}\text{Nb}_{0.3}\text{Ti}_{0.55}\text{O}_2$	1080	Tetragonal rutile	75.0	12800		280	1522
3619	$x\text{Bi}_{2/3}\text{MoO}_4\text{-}1\text{-}x\text{BiVO}_4$ ( $x=0.5\text{-}0.7$ )	850	Monoclinic/Tetragonal phase boundary	75	8000			1523
3620	$\text{Ba}_4\text{Sm}_{9.33}\text{Ti}_{18}\text{O}_{54}\text{+}0.5\text{ wt}\% \text{GeO}_2$	1200	Tungsten-Bronze Orthorhombic	75.2	5200		-12	1524
3621	$\text{BaSm}_2\text{Ti}_4\text{O}_{12}\text{+}1\text{ wt}\% \text{CuO}$	1160	Tungsten Bronze	75.8	4900		-8	1525
3622	$\text{Ba}_{6-3x}(\text{Sm}_{1-y}\text{Nd}_y)_{8+2x}\text{Ti}_{1-z}\text{Sn}_z)_{18}\text{O}_{54}$ ( $x=2/3$ , $y=0$ , $z=0.05$ )		Tungsten Bronze	76.0	6260	4.1	2	1526
3623	$\text{Ba}_{6-3x}\text{Sm}_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ )+0.5 wt% ( $30\text{BaO-}40\text{B}_2\text{O}_3\text{-}30\text{SiO}_2$ )	1220	Tungsten Bronze Orthorhombic	76.0	9100	-	-7	1475
3624	$\text{Ba}_{6-3x}(\text{Sm}_{1-y}\text{Nd}_y)_{8+2x}\text{Ti}_{1-z}\text{Sn}_z)_{18}\text{O}_{54}$ ( $x=2/3$ , $y=0.1$ , $z=0.05$ )		Tungsten-Bronze Orthorhombic	76.0	7130	4.2	6	1526
3625	$(\text{Bi}_{1.92}\text{Ca}_{0.08})(\text{Zn}_{0.64}\text{Nb}_{1.36})\text{O}_7$	960	Pyrochlore-Monoclinic	76.0	3900			1520
3626	$(\text{Bi}_{1.92}\text{Cd}_{0.08})(\text{Zn}_{0.64}\text{Nb}_{1.36})\text{O}_7$	980	Pyrochlore-Monoclinic	76.0	700			1526
3627	$\text{Ba}_4\text{Sm}_{9.33}\text{Ti}_{18}\text{O}_{54}$	1350	Tungsten-Bronze Orthorhombic	76.0	10000		-12	1475
3628	$\text{Y}_2\text{Ti}_2\text{O}_7\text{+}8\text{ wt}\% \text{Bi}_2\text{O}_3\text{-+}1\text{ mol}\%$ $\text{Nd}_2\text{O}_3\text{-Nb}_2\text{O}_5$	1350	composite	76.0	18950		26	1527
3629	$\text{Ba}_{6-3x}(\text{Sm}_{1-y}\text{Nd}_y)_{8+2x}(\text{Ti}_{1-z}\text{Sn}_z)\text{O}_{54}$ ( $x=2/3$ , $y=0$ , $z=0.05$ )		Tungsten-Bronze Orthorhombic	76.0	6260		2	1526
3630	$\text{Bi}_3(\text{Nb}_{0.8}\text{V}_{0.2})\text{O}_7$	870	cubic	76.0	460		3	1528
3631	$\text{Ba}_4\text{Sm}_{9.33}\text{Ti}_{18}\text{O}_{54}\text{+}0.5\text{ wt}\% \text{B}_2\text{O}_3$	1200	Tungsten-Bronze Orthorhombic	76.1	10500		-19	1524
3632	$\text{Ba}_{4.5}\text{Gd}_9\text{Ti}_{18}\text{O}_{54}$		Tungsten Bronze	76.1	2050		-35	1529
3633	$\text{Sr}_4\text{Ti}_3\text{O}_{10}(\text{Sr}_{n+1}\text{Ti}_n\text{O}_{3n+1})$		Perovskite Tetragonal I4/mmm	76.1	12700	2.2	576	1358
3634	$\text{Ba}_{(2-x)}\text{Sm}_{(4+2/3x)}\text{Ti}_9\text{O}_{24}$ ( $x=0.15$ )	1370		76.1	12800	5.2	1	1501
3635	$(\text{Ba}_{4.2}\text{Sm}_{9.2})_\alpha\text{Ti}_{18-y}\text{Al}_y\text{O}_{54}$ ( $y=0.4$ , $\alpha=1+y/36$ , $x=0.6$ )	1440	Tungsten bronze	76.1	3800		-33	1484
3636	$\text{Bi}_2(\text{Zn}_{1/3}\text{Nb}_{2/3})_2\text{O}_7$	950/2h	Monoclinic Pyrochlore	76.2	2980		200	1530
3637	$\text{Li}_{1+x-y}\text{Nb}_{1-x-y}\text{Ti}_{x+4y}\text{O}_3$ ( $x=0.15$ , $y=0$ )	1100/1h	M -Phase	76.2	1000	5.3	-62	1400, 1438
3638	$\text{Ba}_4(\text{Nd}_{0.7}\text{Sm}_{0.3})_{9.33}\text{Ti}_{18}\text{O}_{54}\text{+}2\text{ wt}\% \text{BBS}$	1000	Tungsten-Bronze Orthorhombic	76.3	8300		18	1531
3639	$\text{Ba}_4\text{Sm}_{7.33}\text{Eu}_2\text{Ti}_{18}\text{O}_{54}$	1460	Tungsten Bronze	76.4	8990		-16	1512
3640	$\text{Ba}_4\text{Nd}_{1.33}\text{Eu}_8\text{Ti}_{18}\text{O}_{54}$	1400	Tungsten Bronze	76.6	8590		-21	1512

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
3641	Ba(Mg <sub>0.167</sub> Ta <sub>0.33</sub> Ti <sub>0.50</sub> )O <sub>3</sub>	1550	Perovskite	76.6	10000	4.1	113	883
3642	Ba <sub>4</sub> (Nd <sub>0.7</sub> Sm <sub>0.3</sub> ) <sub>9.33</sub> Ti <sub>18</sub> O <sub>54</sub> +1 wt% BBS glass	1100	Tungsten-Bronze Orthorhombic	76.6	8200		13	1531
3643	Bi <sub>2</sub> (Zn <sub>1/3</sub> Nb <sub>2/3-x</sub> V <sub>x</sub> ) <sub>2</sub> O <sub>7</sub> (x=0.001))	990	Pyrochlore Monoclinic	76.7	3580		-88	1532
3644	0.91BiVO <sub>4</sub> -0.09Li <sub>0.5</sub> La <sub>0.5</sub> WO <sub>4</sub>	750	Monoclinic	76.7	6800		7	1506
3645	Ba <sub>4.2</sub> Sm <sub>9.2</sub> Ti <sub>18</sub> O <sub>54</sub> +0.2 wt% Al <sub>2</sub> O <sub>3</sub>	1340/3h	Tungsten-Bronze	76.9	10100		-23	1533
3646	Ba <sub>4</sub> Eu <sub>9.33</sub> Ti <sub>18</sub> O <sub>54</sub>	1400	Tungsten-Bronze Orthorhombic	77.0	6580		34	1512
3647	Ba <sub>6-3x</sub> (Sm <sub>1-y</sub> Nd <sub>y</sub> ) <sub>8+2x</sub> Ti <sub>1-z</sub> Sn <sub>z</sub> ) <sub>18</sub> O <sub>54</sub> (x=2/3, y=0.3, z=0.05)		Tungsten Bronze	77.0	7850	4.2	9	1526
3648	(Ti <sub>0.9</sub> Zr <sub>0.1</sub> )O <sub>2</sub>	1400/5h	Rutile Tetragonal P4 <sub>2</sub> /mmm	77.0	14000	4		53
3649	24 wt% BaTiO <sub>3</sub> -76 wt% Nd <sub>2</sub> O <sub>3</sub> -3TiO <sub>2</sub>	1220	composite	77.0	11000		123	1534
3650	(Ba <sub>1-<math>\alpha</math></sub> Sm <sub><math>\alpha</math></sub> ) <sub>4.2</sub> Sm <sub>9.2</sub> Ti <sub>18</sub> O <sub>54</sub> $\alpha$ =0.1	1450/2h	Tungsten-Bronze Orthorhombic	77.0	6680		-11	1535
3651	BaSm <sub>2</sub> Ti <sub>5</sub> O <sub>14</sub>		Tungsten Bronze Orthorhombic Pbam	77.0	9300		12	1536, 1537
3652	Ba <sub>6-3x</sub> (Sm <sub>1-y</sub> Nd <sub>y</sub> ) <sub>8+2x</sub> (Ti <sub>1-z</sub> Sn <sub>z</sub> )O <sub>54</sub> (x=2/3, y=0.3, z=0.05)	1360/12	Tungsten-Bronze Orthorhombic Pbam	77.0	8185	4	1	1536
3653	Ba <sub>4</sub> Sm <sub>9.33</sub> Ti <sub>18</sub> O <sub>54</sub> +0.5 wt% GeO <sub>2</sub>	950	Tungsten-Bronze Orthorhombic Pbam	77.3	8900		-19	1524
3654	Na <sub>0.5x</sub> Bi <sub>1-0.5x</sub> (Mo <sub>x</sub> V <sub>1-x</sub> )O <sub>4</sub> (x=0.05)	720		77.3	8000	3.8	20	1538
3655	Ba <sub>6-3x</sub> Sm <sub>8+2x</sub> Ti <sub>18</sub> O <sub>54</sub> +0.5 wt% GeO <sub>2</sub> +0.5 wt% B <sub>2</sub> O <sub>3</sub> (x=2/3)	1150	Tungsten-Bronze Orthorhombic Pbam	77.3	8900		-13	1524
3656	Ba <sub>(2-x)</sub> Sm <sub>(4+2/3x)</sub> Ti <sub>9</sub> O <sub>24</sub> (x=0)	1360		77.5	11200	5.2	-3	1501
3657	Li <sub>1+x-y</sub> Nb <sub>1-x-y</sub> Ti <sub>x+4y</sub> O <sub>3</sub> (x=0.05, y=0.05)	1100/1h	M -Phase	77.8	2180	5.2	-42	1400, 1438
3658	Ba <sub>4</sub> Nd <sub>5.33</sub> Eu <sub>4</sub> Ti <sub>18</sub> O <sub>54</sub>	1460	Tungsten-Bronze Orthorhombic Pbam	78.0	10460		10	1512
3659	(Ba <sub>4.2</sub> Sm <sub>9.2</sub> ) <sub>a</sub> Ti <sub>17.8</sub> Al <sub>0.2</sub> O <sub>54</sub>	1460	Tungsten-Bronze Orthorhombic	78.0	8233	4.8	-18	1484
3660	Pb <sub>0.5</sub> Ca <sub>0.5</sub> (Li <sub>1/4</sub> Nb <sub>3/4</sub> )O <sub>3</sub>		Perovskite	78.0	2000	3.7	460	996
3661	Pb <sub>0.4</sub> Ca <sub>0.6</sub> [(Fe <sub>1/2</sub> Nb <sub>1/2</sub> ) <sub>0.95</sub> Sn <sub>0.05</sub> O <sub>3</sub>	1150/3h	Perovskite Orthorhombic	78.0	6000		-9	1497
3662	Ca(Zr <sub>0.6</sub> Ti <sub>0.4</sub> )O <sub>3</sub>		Perovskite Orthorhombic	78.0	7840			906
3663	(Ni <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>1-x</sub> Ti <sub>x</sub> O <sub>2</sub> (x=0.4)	1200	Rutile Tetragonal P4 <sub>2</sub> /mmm	78.0	17060		98	1276

3664	Ba <sub>3</sub> LiNb <sub>3</sub> Ti <sub>5</sub> O <sub>21</sub>	1100	Hexagonal P6 <sub>3</sub> /mcm	78.0	9800		205	1443
3665	(Ba <sub>4.2</sub> Sm <sub>9.2</sub> ) <sub>α</sub> Ti <sub>18-y</sub> Al <sub>y</sub> O <sub>54</sub> (y=0.2, α=1+y/36, x=0.6)	1460	Tungsten-Bronze Orthorhombic Pbam	78.0	8200		-18	1484
3666	K <sub>0.5x</sub> Bi <sub>1-0.5x</sub> (Mo <sub>x</sub> V <sub>1-x</sub> )O <sub>4</sub> (x=0.8-0.1)	700	Scheelite Tetragonal	78.0	7800			1539
3667	Ba <sub>4</sub> (Nd <sub>28/3-y</sub> Yb <sub>y</sub> )Ti <sub>18</sub> O <sub>54</sub> (y=1)	1480/2h	Tungsten-Bronze Orthorhombic	78.4	6780		53	1542
3668	Ba <sub>1(2-x)</sub> Sm <sub>1(4+2/3x)</sub> Ti <sub>9</sub> O <sub>24</sub> (x=0.05)	1360		78.5	11900	5.2	-2	1501
3669	Bi <sub>2</sub> (Zn <sub>1/3</sub> Nb <sub>2/3-x</sub> V <sub>x</sub> ) <sub>2</sub> O <sub>7</sub> (x=0.001)	850/2	Pyrochlore Monoclinic	78.5	3780			1530
3670	Ba <sub>4</sub> Nd <sub>8.33</sub> DyTi <sub>18</sub> O <sub>54</sub>	1480	Orthorhombic Pbam	78.6	10040	4.8	34	1537
3671	Ba <sub>6-3x</sub> Sm <sub>8+2x</sub> Ti <sub>18</sub> O <sub>54</sub> (x=0.75)		Orthorhombic Pbam	78.6	8700		-	1536
3672	Bi <sub>2</sub> (Zn <sub>1/3</sub> Nb <sub>2/3-x</sub> V <sub>x</sub> ) <sub>2</sub> O <sub>7</sub> (x=0.003)	850/2	Pyrochlore monoclinic	78.6	3140			1530
3673	Ba <sub>4</sub> Sm <sub>8.33</sub> EuTi <sub>18</sub> O <sub>54</sub>	1460	Tungsten-Bronze Orthorhombic Pbam	78.7	9560		-11	1512
3674	Ba <sub>4</sub> Sm <sub>9.33</sub> Ti <sub>18</sub> O <sub>54</sub> +0.3 mol% TiO <sub>2</sub>	1350	Tungsten Bronze Pbam	78.8	10750	4.8	-21	1508
3675	(1-x)Ca <sub>0.61</sub> Nd <sub>0.26</sub> TiO <sub>3</sub> -xNd(Zn <sub>0.5</sub> Ti <sub>0.5</sub> )O <sub>3</sub> +x=0.15		Perovskite	78.8	19200		134	1505
3676	Ba <sub>6-3x</sub> Sm <sub>8+2x</sub> Ti <sub>18</sub> O <sub>54</sub> (x=0.5)		Tungsten-Bronze Orthorhombic Pbam	78.9	8400		-19	1536, 1540
3677	Pb <sub>0.5</sub> Ca <sub>0.5</sub> (Na <sub>1/4</sub> Nb <sub>3/4</sub> )O <sub>3</sub>		Perovskite	79.0	400	3.7	550	996
3678	(Ba <sub>0.97</sub> Ca <sub>0.03</sub> )-Sm <sub>2</sub> O <sub>3</sub> -4.5TiO <sub>2</sub>		Tungsten Bronze	79.0	10500	10	-5	1536
3679	Bi <sub>18</sub> (Ca <sub>1-x</sub> Zn <sub>x</sub> ) <sub>8</sub> Nb <sub>12</sub> O <sub>65</sub> (x=0.725)	925		79.0	1000	3.2	1	1452
3680	Bi <sub>3</sub> NbO <sub>7</sub> +20 wt% Bi <sub>4</sub> B <sub>2</sub> O <sub>9</sub>	900	Composite	79.0	1000		8	1541
3681	Ba <sub>4</sub> Nd <sub>8.33</sub> HoTi <sub>18</sub> O <sub>54</sub>	1480	Tungsten-Bronze Orthorhombic Pbam	79.3	9690	4.7	31	1542
3682	Ba <sub>4</sub> Nd <sub>8.33</sub> ErTi <sub>18</sub> O <sub>54</sub>	1480	Tungsten-Bronze Orthorhombic	79.5	8290	4.1	53	1542
3683	Ba <sub>4</sub> Nd <sub>8.33</sub> YbTi <sub>18</sub> O <sub>54</sub>	1480	Tungsten-Bronze Orthorhombic Pbam	79.4	6780	4.7	33	1542
3684	Ba <sub>6-3x</sub> La <sub>8+2x</sub> Ti <sub>1-z</sub> Zr <sub>x</sub> ) <sub>18</sub> O <sub>54</sub> (x=2/3, z=0.1)		Tungsten-Bronze Orthorhombic	79.6	6670	4.83	109	1543
3685	Ba <sub>6-3x</sub> Sm <sub>8+2x</sub> Ti <sub>18</sub> O <sub>54</sub> (x=2/3)+1 wt% Bi <sub>2</sub> O <sub>3</sub> and Ba <sub>x</sub> Sr <sub>1-x</sub> TiO <sub>3</sub>		Tungsten-Bronze Orthorhombic	79.6	10800		2	1544
3686	Ca <sub>(1-x)</sub> Nd <sub>2x/3</sub> TiO <sub>3</sub> (x=0.3)		Perovskite	79.7	13000		295	1545
3687	Ba <sub>6-3x</sub> Sm <sub>8+2x</sub> Ti <sub>18</sub> O <sub>54</sub> -0.1TiO <sub>2</sub> (x=2/3)	1350/2h	Tungsten-Bronze Orthorhombic	79.8	9880		-18	1508
3688	Bi <sub>3</sub> NbO <sub>7</sub>		Cubic Fm3m	80.0	300	5		1546

(continued)



No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
3689	$\text{Ba}_4\text{Sm}_{9.33}\text{Ti}_{18}\text{O}_{54}$	1450	Tungsten Bronze	80.0	10700	4.7	-15	1524
3690	$91.9\text{TiO}_2\text{-}8.1\text{Bi}_2\text{O}_3$		Mixture phases	80.0	9000		21	1434
3691	$0.58(\text{Sm}_{1/2}\text{Li}_{1/2})\text{TiO}_3\text{-}$ $0.42(\text{Sm}_{1/2}\text{Na}_{1/2}\text{Ti})\text{O}_3$	1350	Tetragonal	80.0	2000	10		1521
3692	$0.8\text{Bi}_2\text{O}_3\text{-}0.3\text{Nb}_2\text{O}_5$	920/3h	Flourite $\delta\text{-Bi}_2\text{O}_3$ Fm-3m	80.0	420		-306	1396
3693	$(\text{Ti}_{0.9}\text{Ge}_{0.1})\text{O}_2$	1400/5h	Rutile Tetragonal $\text{P4}_2/\text{mmm}$	80.0	24000	4		53
3694	$(\text{Sm}_{1/2}\text{Na}_{1/2}\text{Ti})\text{O}_3$	1350	Perovskite Tetragonal $\text{I4}/\text{mmm}$	80.0	13000	10		1521
3695	$(\text{La}_{0.44}\text{Sr}_{0.33})\text{TiO}_3$	1350	Orthorhombic $\text{Ibmm}$	80.0	7500	3	70	1547
3696	$(\text{Li}_{1/2}\text{Nd}_{1/2})\text{TiO}_3$		Perovskite Orthorhombic	80.0	3100	4	-310	1548
3697	$0.15(\text{Ba}_{0.95}\text{Sr}_{0.05})\text{-}0.15\text{Sm}_2\text{O}_3\text{-}0.7\text{TiO}_2$	1380		80.0	11000	3	0	1549
3698	$\text{Pb}_{0.4}\text{Ca}_{0.6}(\text{Fe}_{1/2}\text{Nb}_{1/2})\text{O}_3$		Perovskite	80.0	6100	3.2	-25	996
3699	$\text{Ba}_{6-3x}(\text{Sm}_{1-y}\text{Nd}_y)_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ , $y=0.1$ )	1340/6h	Tungsten-Bronze Orthorhombic	80.0	9620	3.75		1550
3700	$\text{Ba}_{6-3x}(\text{Sm}_{1-y}\text{Nd}_y)_{8+2x}(\text{Ti}_{1-z}\text{Sn}_z)\text{O}_{54}$ ( $x=2/3$ , $y=0.8$ , $z=0.05$ )	1360/12	Tungsten-Bronze Orthorhombic Pbam	80.0	10600	3.9	11	1526
3701	$\text{Ba}_{6-3x}(\text{Sm}_{1-y}\text{Nd}_y)_{8+2x}(\text{Ti}_{1-z}\text{Sn}_z)\text{O}_{54}$ ( $x=2/3$ , $y=0.5$ , $z=0.05$ )	1360/12	Tungsten-Bronze Orthorhombic	80.0	10050	4	5	1526
3702	$\text{BaO-Bi}_2\text{O}_3\text{-Nd}_2\text{O}_3\text{-TiO}_2\text{+}0.4\text{ wt\%}$ $\text{Mn}(\text{CH}_3\text{COO})_2\text{+WO}_3$	1320		80.0	7000		0	1551
3703	$(\text{Ba}_{1-\alpha}\text{Sr}_\alpha)_{4.2}\text{Sm}_{9.2}\text{Ti}_{18}\text{O}_{54}$ ( $\alpha=0.01$ )	1450/2h	Tungsten-Bronze Orthorhombic	80.0	8890		-11	1535
3704	$(\text{Ba}_{1-\alpha}\text{Sr}_\alpha)_{6-3x}\text{Sm}_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $\alpha=0.06$ , $x=0.6$ )		Tungsten-Bronze Orthorhombic	80.0	10075		-7	1535
3705	$\text{Bi}_3(\text{Nb}_{0.9}\text{V}_{0.1})\text{O}_7$	870	Tetragonal	80	600		-22	1528
3706	$(\text{Pb}_{1-x}\text{Ca}_x)\text{ZrO}_3$		Perovskite	80- 120	2000- 4000		-	1460
3707	$\text{Sr}(\text{Bi}_{1-x}\text{Nd}_x)_8\text{Ti}_7\text{O}_{27}$	1250		80- 120	120- 2100		-	1552
3708	$(\text{Ba}_{0.952}\text{Sr}_{0.048})_{4.2}\text{Sm}_{9.2}\text{Ti}_{18}\text{O}_{54}$		Tungsten-Bronze Orthorhombic Pbam	80.1	10205	4.9	-9	1535
3709	$(\text{Ba}_{1-\alpha}\text{Sr}_\alpha)_{4.2}\text{Sm}_{9.2}\text{Ti}_{18}\text{O}_{54}$ ( $\alpha=0.06$ )	1450/2h	Tungsten-Bronze Orthorhombic Pbam	80.2	10075		-7	1535

3710	$(\text{Ba}_{1-\alpha}\text{Sr}_\alpha)_{4.2}\text{Sm}_{9.2}\text{Ti}_{18}\text{O}_{54}$ ( $\alpha=0.0$ )	1450/2h	Tungsten-Bronze Orthorhombic Pbam	80.3	9500		-9	1535
3711	$\text{Ca}_{0.8}\text{Sr}_{0.2}\text{TiO}_3\text{-Li}_{0.5}\text{Sm}_{0.5}\text{TiO}_3 + x \text{ wt\% } [\text{YB}_2\text{O}_3\text{-(1-y)CuO}]$ ( $x=7.5, y=0.5$ )	900	Perovskite	80.4	3000		-	1513
3712	$(\text{Ba}_{1-\alpha}\text{Sr}_\alpha)_{4.2}\text{Sm}_{9.2}\text{Ti}_{18}\text{O}_{54}$ ( $\alpha=0.04$ )	1450/2h	Tungsten Bronze	80.6	9590		-12	1535
3713	$\text{Ba}_{4.2}\text{Nd}_{9.2}\text{Ti}_{18-x}\text{Sn}_x\text{O}_{54}$ ( $x=0.5$ )	1340/2h	Tungsten Bronze	80.6	9200		61	1553
3714	$\text{Ba}_{6-3x}\text{Sm}_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ )	1360/3h	Tungsten-Bronze Orthorhombic	80.8	11330	4	-11	1508, 1554, 1555
3715	$\text{Ba}_{6-3x}(\text{Sm}_{0.2}\text{Nd}_{0.8})_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ )	1330/3h	Tungsten Bronze	80.8	8100		36	1556
3716	$\text{BaO-Pr}_6\text{O}_{11}\text{-TiO}_2$		Tungsten Bronze	81.0	9000	5	130	1516
3717	$(\text{Ba}_{1-x}\text{Ca}_x)\text{O-Sm}_2\text{O}_3\text{-4.5TiO}_2$ ( $x=0.05$ )		Tungsten Bronze	81.0	9500		2	1557
3718	$\text{Pb}_{1-x}\text{Ca}_x[(\text{Fe}_{1/2}\text{Nb}_{1/2})_{1-y}\text{Sn}_y]\text{O}_3$ ( $x=0.6, y=0.05$ )	1150/3h	Perovskite	81.0	4830		3	1497
3719	$\text{Bi}_2\text{O}_3\text{-TiO}_2$ (1:11.3)+0.112 wt% CuO	915/2h		81.0	8900		0	1558
3720	$\text{Ba}_{6-3x}(\text{Sm}_{1-y}\text{Nd}_y)_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3, y=0.3$ )	1340/12h	Tungsten Bronze	81.0	9630	3.9		1550
3721	$[(\text{Li}_{0.5}\text{Bi}_{0.5})_x\text{Bi}_x][\text{Mo}_x\text{V}_{1-x}]\text{O}_4$ ( $x=0.098$ )	650	Monoclinic sheelite	81.0	8000		10	1559
3722	$\text{Ba}_{3.75}\text{Nd}_{9.5}\text{Ti}_{17}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_{54}$	1350/2h	Tugsten Bronze	81.0	7300		17	1560
3723	$\text{Ba}_4(\text{Nd}_{0.7}\text{Sm}_{0.3})_{9.33}\text{Ti}_{18}\text{O}_{54} + 0.5 \text{ wt\% Ag}$	1100	Tungsten Bronze	81.1	11000	4.6	3	1531
3724	$\text{Ba}_4\text{Sm}_{5.33}\text{Eu}_4\text{Ti}_{18}\text{O}_{54}$	1460	Tungsten Bronze Orthorhombic	81.1	7109		-20	1512
3725	$\text{Ba}_4\text{Nd}_{7.33}\text{Eu}_2\text{Ti}_{18}\text{O}_{54}$	1460	Tungsten Bronze Orthorhombic	81.1	10660		31	1512
3726	$\text{Ba}_4\text{Sm}_{3.33}\text{Eu}_6\text{Ti}_{18}\text{O}_{54}$	1400	Tungsten Bronze Orthorhombic	81.2	8604		-26	1512
3727	$\text{Ba}_{4.2}\text{Sm}_{9.2}\text{Ti}_{18}\text{O}_{54} + 4 \text{ wt\% SrTiO}_3$	1360/2h	Tungsten Bronze Orthorhombic	81.2	8470		-2	1561
3728	$\text{Ba}_4(\text{Nd}_{0.7}\text{Sm}_{0.3})_{9.33}\text{Ti}_{18}\text{O}_{54} + 1 \text{ wt\% Ag}$	1100	Tungsten Bronze Orthorhombic	81.2	11000	4.84	1	1531
3729	$\text{Ba}_4\text{Sm}_{9.33}\text{Ti}_{18}\text{O}_{54}(\text{SPS})$	1200/ 5mn	Tungsten Bronze	81.2	10099	5	-17	1562
3730	$(\text{Ba}_{0.98}\text{Sr}_{0.02})_{4.2}\text{Sm}_{9.2}\text{Ti}_{18}\text{O}_{54}$		Tungsten Bronze Orthorhombic	81.4	9661	4.8	-11	1535
3731	$\text{Ba}_4\text{Sm}_{9.33}\text{Ti}_{18}\text{O}_{54} + 14 \text{ mol\% TiO}_2$	1350	Composite	81.5	10415	5	0	1508
3732	$\text{Ba}_{6-3x}\text{Sm}_{8+2x}\text{Ti}_{18}\text{O}_{54}\text{-0.1TiO}_2\text{-1.4TiO}_2$ ( $x=2/3$ )	1350/2h	Tungsten Bronze	81.5	10400		0	1508

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
3733	$\text{Ba}_{6-3x}(\text{Sm}_{1-y}\text{Nd}_y)_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ , $y=0.84$ )	1400/10h	Tungsten Bronze orthorhombic	81.7	10500		2	1563
3734	$\text{LiNb}_{0.6}\text{Ti}_{0.5}\text{O}_3$ textured			81.8	5750		-43	1563b
3735	$(\text{Li}_{1/2}\text{Nd}_{1/2})\text{TiO}_3$		Pervskite Tetragonal	82.0	2220		292	1564
3736	$\text{Ba}_{6-x}\text{Sm}_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=0.5$ )	1300	Tungsten bronze	82.0	10150		-17	1563
3737	$(\text{Pb}_{0.45}\text{Ca}_{0.55})[(\text{Fe}_{0.5}(\text{Nb}_{0.96}\text{Ta}_{0.04})_{0.5})\text{O}_3]$	1150/3h	Perovskite cubic Pm3m	82.0	7650		-5	1565
3738	$\text{Ba}_{6-3x}(\text{Sm}_{1-y}\text{Nd}_y)_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ , $y=0.5$ )	1340/16h	Tungsten Bronze orthorhombic	82.0	9500	3.75		1550
3739	$(\text{Ba}_{0.8}\text{Ca}_{0.2})_{6-3x}\text{Sm}_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=1.5$ )	1350	Tungsten Bronze orthorhombic	82.0	10000		-20	1566
3740	$\text{Ba}_{6-3x}(\text{Sm}_{1-y}\text{Nd}_y)_{8+2x}\text{Ti}_{1-z}\text{Sn}_z)_{18}\text{O}_{54}$ ( $x=2/3$ , $y=0.8$ , $z=0.05$ )	1360/3h	Tungsten Bronze orthorhombic	82.0	1000	4.1	17	1526
3741	$\text{Ba}_4\text{Sm}_{8.08}\text{Li}_{0.25}\text{Ti}_{18}\text{O}_{54}$	1400	Tungsten Bronze orthorhombic	82.1	5620	4.7	-2	1567
3742	$\text{Ba}\{\text{Ti}_{0.95}\text{Fe}_{0.05}\}\text{O}_{3-d}$	1450	Perovskite	82.1	4800	4		1446
3743	$\text{Ba}_{6-3x}(\text{Sm}_{0.2}\text{Nd}_{0.8})_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ )+1 wt% $\text{Bi}_2\text{O}_3$	1200/3h	Tungsten Bronze orthorhombic	82.1	8530		17	1556
3744	$\text{Ba}_4\text{La}_4\text{Ti}_7\text{O}_{24}$		Hexagonal	82.2	500		317	1473
3745	$\text{Ba}_{6-3x}[\text{Nd}_{(8+2x)-y}\text{Bi}_y]\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ , $y=0.05$ )	1380	Tungsten bronze	82.2	9760		62	1519
3746	$(\text{Ba}_{0.8}\text{Sr}_{0.2})_{4.2}\text{Sm}_{9.2}\text{Ti}_{18}\text{O}_{54}$		Tungsten Bronze orthorhombic	82.3	2860		0	1535
3747	$\text{Ba}_4(\text{Sm}_{0.95}\text{Bi}_{0.05})_{9+1/3}\text{Ti}_{18}\text{O}_{54}$	1420	Tungsten Bronze orthorhombic	82.3	8810		-17	1568
3748	$\text{Ba}_{6-3x}\text{Sm}_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=0.6$ )	1450	Tungsten Bronze orthorhombic	82.5	10500	4.6	-12	1554
3749	$\text{Ba}_4\text{Nd}_{9.33}\text{Ti}_{18}\text{O}_{54}$	1460	Tungsten bronze	82.5	10060		71	1516
3750	$(\text{Pb}_{1-x}\text{Ca}_x)[\text{Fe}_{1/2}\text{Nb}_{1/2}]_{1-y}\text{Zr}_y\text{O}_3$ ( $y=0.01$ , $x=0.55$ )	1150	Perovskite	82.5	6800	3.8	-3	1488
3751	$\text{Ba}_4\text{Nd}_{8.33}\text{EuTi}_{18}\text{O}_{54}$	1480	Tungsten Bronze orthorhombic	82.6	10400	4.8	47	1542
3752	$\text{Ba}_{6-3x}(\text{Sm}_{1-y}\text{Nd}_y)_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ , $y=0.72$ )	1400/10h	Tungsten Bronze orthorhombic	82.7	10500		4	1563
3753	$\text{Ba}_{4.2}\text{Sm}_{9.2}\text{Ti}_{18}\text{O}_{54}$	1500	Tungsten Bronze orthorhombic	83.0	8950	3.5	-13	1569
3754	$\text{BaO-Nd}_2\text{O}_3\cdot 5\text{TiO}_2$	1450/2h	Tungsten bronze	83.0	10500		70	1516
3755	$\text{Ba}_{4.2}(\text{Sm}_{0.9}\text{Nd}_{0.1})_{9.2}\text{Ti}_{18}\text{O}_{54}$	1500	Tungsten Bronze orthorhombic	83.0	8936	3.5	-6	1569
3756	$\text{CaBa}_4\text{Nb}_2\text{TiO}_{12}$	1470	Cubic perovskite	83.0	1200	2.9	60	1307

3757	$(\text{Pb}_{0.45}\text{Ca}_{0.55})[(\text{Fe}_{0.5}\text{Nb}_{0.5})_{0.9}\text{Sn}_{0.1}]\text{O}_3 + 0.2 \text{ wt\% CuO} + 0.1 \text{ wt\% Bi}_2\text{O}_3$	1000/3h	Tungsten Bronze	83.0	6080		8	1570
3758	$(\text{Ni}_{1/3}\text{Nb}_{2/3})_{1-x}\text{Ti}_x\text{O}_2$ ( $x=0.5$ )	1200	Rutile Tetragonal $\text{P4}_2/\text{mmm}$	83.1	19300		165	1276
3759	$\text{Ba}_{6-3x}(\text{Sm}_{1-y}\text{Nd}_y)_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ , $y=0.6$ )	1400/10h	Tungsten Bronze Orthorhombic	83.4	10700	4	11	1550
3760	$\text{Ba}\{\text{Ti}_{0.92}\text{Ga}_{0.008}\}\text{O}_{3-\delta}$	1450	Perovskite Hexagonal	83.7	4200	4.2		1446
3761	$\text{Ba}_{6-3x}(\text{La}_{1-y-z}\text{Sm}_y\text{Bi}_z)_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ , $y=0.7$ , $z=0$ )	1350/3h	Tungsten Bronze	83.8	8000	4.0	33	1571
3762	$(\text{Pb}_{1/2}\text{Ca}_{1/2})(\text{Fe}_{1/2}\text{Ta}_{1/2})\text{O}_3$	1250/ 30 min	Perovskite Cubic	83.9	6680	7		1572
3763	$\text{Ba}_4(\text{Nd}_{0.95}\text{Bi}_{0.05})_{9.33}\text{Ti}_{18}\text{O}_{54}$	1360	Tungsten Bronze Orthorhombic	83.9	8330		32	1568
3764	$\text{Ba}_{4.2}(\text{Sm}_{0.9}\text{La}_{0.1})_{9.2}\text{Ti}_{18}\text{O}_{54}$	1500	Tungsten Bronze Orthorhombic	84.0	9050	3.5	2	1569
3765	$\text{Ba}_{6-3x}(\text{Sm}_{1-y}\text{Nd}_y)_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=0.6$ , $y=0.2$ )	1500/2h	Tungsten Bronze	84.0	9000		0	1569
3766	$\text{BaO}(\text{Nd}_{0.8}\text{Bi}_{0.2})_2\text{O}_3 \cdot 4\text{TiO}_2 + \text{Bi}_2\text{O}_3 - \text{B}_2\text{O}_3 - \text{ZnO} - \text{SiO}_2$			84.0	3000		24	1573
3767	$\text{Ba}_{6-3x}\text{Sm}_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=0.7$ ) hotpressed	1200	Tungsten Bronze Orthorhombic	84.0	9960		-14	1574
3768	$0.95\text{TiO}_2 - 0.05\text{Bi}_2\text{Ti}_4\text{O}_{11}$	1200		84.0	12500		230	1372
3769	$\text{BaPr}_2\text{Ti}_5\text{O}_{14}$		Tungsten Bronze Orthorhombic	84.0	9000	5	150	1575
3770	$(\text{Ba}_{0.9}\text{Ca}_{0.1}) - \text{Sm}_2\text{O}_3 - 4.5\text{TiO}_2$		Tungsten bronze	84.0	9500	10	25	1557
3771	$\text{Ba}_4(\text{Sm}_{0.9}\text{Bi}_{0.1})_{9+1/3}\text{Ti}_{18}\text{O}_{54}$	1380	Tungsten Bronze Orthorhombic	84.1	7840		-21	1568
3772	$0.4\text{PbZrO}_3 - 0.6\text{Ca}(\text{Fe}_{1/2}\text{Nb}_{1/2})\text{O}_3$		Perovskite	84.7	3000	4.2	41	1576
3773	$\text{Ba}_{4.2}(\text{Sm}_{0.7}\text{Nd}_{0.3})_{9.2}\text{Ti}_{18}\text{O}_{54}$	1500	Tungsten Bronze Orthorhombic	85.0	9160	3.5	9	1569
3774	$\text{Ba}_{6-3x}(\text{Sm}_{1-y}\text{Nd}_y)_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ , $y=0.8$ )	1340/12h	Tungsten Bronze Orthorhombic	85.0	9460	3.9	1	1550
3775	$0.77\text{Bi}_2\text{O}_3 - 0.23\text{Nb}_2\text{O}_5$	900/3h	Flourite $\delta\text{-Bi}_2\text{O}_3$ Fm-3m	85.0	350		-215	1396
3776	$\text{Pb}_{1-x}\text{Ca}_x[(\text{Fe}_{1/2}\text{Nb}_{1/2})_{1-y}\text{Sn}_y]\text{O}_3$ ( $x=0.55$ , $y=0.1$ )	1150/3h	Perovskite	85.0	8600		0	1497
3777	$(\text{Pb}_{1-x}\text{Ca}_x)[(\text{Fe}_{1/2}\text{Nb}_{1/2})_{1-y}\text{Zr}_y]\text{O}_3$ ( $y=0.1$ , $x=0.55$ )	1200	Perovskite	85.0	8600		-1	1488
3778	$\text{Bi}_3\text{Nb}_{0.8}\text{Ta}_{0.2}\text{O}_7$	855/4h		85.0	800		24	1577
3779	$\text{Pb}_{0.45}\text{Ca}_{0.55}[(\text{Fe}_{1/2}\text{Nb}_{1/2})_{0.9}\text{Sn}_{0.1}]\text{O}_3$	1150/3h	Perovskite Orthorhombic	85.3	8600		0	1497

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
3780	Ba <sub>4</sub> Sm <sub>8.33</sub> LiTi <sub>18</sub> O <sub>54</sub>	1400	Tungsten Bronze orthorhombic	85.4	5045	4.5	45	1567
3781	Ba <sub>4.2</sub> (Sm <sub>0.5</sub> Nd <sub>0.5</sub> ) <sub>9.2</sub> Ti <sub>18</sub> O <sub>54</sub>	1500	Tungsten Bronze	86.0	9170	3.4	25	215
3782	Pb <sub>0.5</sub> Ca <sub>0.5</sub> (Mg <sub>1/3</sub> Nb <sub>2/3</sub> )O <sub>3</sub>		Perovskite	86.0	4600	3.0	34	996
3783	(Pb <sub>0.45</sub> Ca <sub>0.55</sub> )[(Fe <sub>0.5</sub> Nb <sub>0.5</sub> ) <sub>0.9</sub> Sn <sub>0.1</sub> ]O <sub>3</sub> + 0.2 wt% CuO+0.4 wt% Bi <sub>2</sub> O <sub>3</sub>	1000/3h	Perovskite Orthorhombic	86.0	4340		8	1578
3784	0.74Bi <sub>2</sub> O <sub>3</sub> -0.26Nb <sub>2</sub> O <sub>5</sub>	900/2h	Flourite $\delta$ -Bi <sub>2</sub> O <sub>3</sub> Fm-3m	86.0	1000		120	1396
3785	BaTi <sub>0.5</sub> Ca <sub>0.25</sub> Nb <sub>0.25</sub> O <sub>3</sub>	1500/4h	Perovskite Tetragonal P4mm	86.0	3050	4		1373
3786	Ba <sub>1.37</sub> Na <sub>0.63</sub> Nd <sub>2</sub> TiO <sub>10</sub>	1250	Orthorhombic Amam	86.0	1500		270	1579
3787	Ba <sub>6-3x</sub> Nd <sub>8+2x</sub> Ti <sub>18</sub> O <sub>54</sub> (x=0.75)		Tungsten Bronze Orthorhombic	86.0	10450		–	1536
3788	Ba <sub>6-3x</sub> (Sm <sub>1-y</sub> Nd <sub>y</sub> ) <sub>8+2x</sub> Ti <sub>18</sub> O <sub>54</sub> (x=0.5, y=0.67)	1400/10h	Tungsten Bronze Orthorhombic	86.0	7850		234	1563
3789	BaNd <sub>2</sub> TiO <sub>12</sub> +0.075 wt% Bi <sub>4</sub> B <sub>2</sub> O <sub>9</sub>	1200	Orthorhombic	86.0	5400		4	287
3790	BaO-Nd <sub>2</sub> O <sub>3</sub> -4TiO <sub>2</sub> +10 wt% Bi <sub>4</sub> B <sub>2</sub> O <sub>9</sub>		Tungsten Bronze	86.0	4700		1	1580
3791	0.15(Ba <sub>0.93</sub> Sr <sub>0.07</sub> )O- 0.15(Sm <sub>0.4</sub> La <sub>0.6</sub> ) <sub>2</sub> O <sub>3</sub> -0.7TiO <sub>2</sub> ]	1370		86.2	16700		95	1581
3792	Pb <sub>0.45</sub> Ca <sub>0.55</sub> [(Fe <sub>1/2</sub> Nb <sub>1/2</sub> ) <sub>0.95</sub> Sn <sub>0.05</sub> ]O <sub>3</sub>	1150/3h	Perovskite Orthorhombic	86.3	6250		2	1497
3793	(Pb <sub>1-x</sub> Ca <sub>x</sub> )[Fe <sub>1/2</sub> Nb <sub>1/2</sub> ] <sub>1-y</sub> Zr <sub>y</sub> ]O <sub>3</sub> (y=0.01, x=0.5)	1150	Perovskite Orthorhombic	86.3	6800	3.7	25	1488
3794	Pb <sub>0.45</sub> Ca <sub>0.55</sub> [(Fe <sub>1/2</sub> Nb <sub>1/2</sub> ) <sub>0.9</sub> Sn <sub>0.1</sub> ]O <sub>3</sub>	1150/3h	Perovskite Orthorhombic	86.7	7900		0	1497
3795	Ba <sub>6-3x-z</sub> Sr <sub>z</sub> Nd <sub>8+2x-y</sub> Bi <sub>y</sub> Ti <sub>18</sub> O <sub>54</sub> (y=0, z=0.9, x=0.5)		Tungsten Bronze	86.7	7200		63	1582
3796	Ba <sub>6-3x</sub> (La <sub>1-y-z</sub> Sm <sub>y</sub> Bi <sub>z</sub> ) <sub>8+2x</sub> Ti <sub>18</sub> O <sub>54</sub> (x=2/3, y=0.5, z=0)	1350/3h	Tungsten Bronze Orthorhombic	86.9	7360	3.8	83	1571
3797	0.9CaTiO <sub>3</sub> -0.1Sm(Mg <sub>0.5</sub> Ti <sub>0.5</sub> )O <sub>3</sub>	1550	Perovskite	87.0	9500	3.2	285	865
3798	(Pb <sub>1-x</sub> Ca <sub>x</sub> )[(Fe <sub>1/2</sub> Nb <sub>1/2</sub> ) <sub>1-y</sub> Zr <sub>y</sub> ]O <sub>3</sub> (y=0.05, x=0.55)	1200	Perovskite Orthorhombic	87.0	8500		-10	1488
3799	Sr(Bi <sub>1-x</sub> Nd <sub>x</sub> ) <sub>8</sub> Ti <sub>7</sub> O <sub>7</sub> (x=0.05)			87.0	190			1583
3800	(Ba <sub>1-z</sub> Pb <sub>z</sub> ) <sub>6-x</sub> Nd <sub>8+2/3x</sub> Ti <sub>18</sub> O <sub>54</sub> (x=2/3, z=0.4)	1400/2h	Tungsten Bronze Orthorhombic	87.0	4000		-32	1584
3801	Ca <sub>(1-x)</sub> Nd <sub>2x/3</sub> TiO <sub>3</sub> (x=0.39)		Perovskite	87.5	12400		242	1545
3802	Pb <sub>0.46</sub> Ca <sub>0.54</sub> [(Fe <sub>1/2</sub> Nb <sub>1/2</sub> ) <sub>0.9</sub> Sn <sub>0.1</sub> ]O <sub>3</sub>	1150/3h	Perovskite Orthorhombic	87.8	7870		5	1497

3803	Ba <sub>4.2</sub> (Sm <sub>0.1</sub> Nd <sub>0.9</sub> ) <sub>9.2</sub> Ti <sub>18</sub> O <sub>54</sub>	1500	Tungsten Bronze Orthorhombic	88.0	9500	3.44	64	1569
3804	Ba <sub>6-x</sub> Nd <sub>8+2x</sub> Ti <sub>18</sub> O <sub>54</sub> (x=0.7) hot pressed	1300	Tungsten Bronze	88.0	4920		55	1574
3805	Ba <sub>4.2</sub> (Sm <sub>0.7</sub> La <sub>0.3</sub> ) <sub>9.2</sub> Ti <sub>18</sub> O <sub>54</sub>	1500	Tungsten Bronze Orthorhombic	88.0	8050	3.44	44	1569
3806	Ba <sub>6-3x</sub> (Sm <sub>1-y</sub> Nd <sub>y</sub> ) <sub>8+2x</sub> Ti <sub>18</sub> O <sub>54</sub> (x=0.6, y=0.9)	1500/2h	Tungsten Bronze Orthorhombic	88.0	8500		64	1569
3807	Ba <sub>6-3x</sub> (Sm <sub>1-y</sub> Nd <sub>y</sub> ) <sub>8+2x</sub> Ti <sub>18</sub> O <sub>54</sub> (x=0.6, y=1.0)	1500/2h	Tungsten Bronze Orthorhombic	88.0	8300		76	1569
3808	BaO-Bi <sub>2</sub> O <sub>3</sub> -TiO <sub>2</sub> -Nd <sub>2</sub> O <sub>3</sub>		Tungsten Bronze	88.0	5500		8	1534
3809	(Ba <sub>1-3z</sub> Pb <sub>z</sub> ) <sub>6-x</sub> Nd <sub>8+2/3x</sub> Ti <sub>18</sub> O <sub>54</sub> (x=2/3, z=0.22)	1400/2h	Tungsten Bronze Orthorhombic	88.0	5500		0	1584
3810	BaO-Nd <sub>2</sub> O <sub>3</sub> -4TiO <sub>2</sub> +0.5 wt% Al <sub>2</sub> O <sub>3</sub> +8 wt% Bi <sub>2</sub> O <sub>3</sub>		Tungsten Bronze	88.0	8000	–	0	1111
3811	(1-x)(Mg <sub>0.95</sub> Zn <sub>0.05</sub> )TiO <sub>3</sub> -xCa <sub>0.6</sub> La <sub>0.8/3</sub> TiO <sub>3</sub> (x=0.9)	1320/4h	Composite	88.0	32800		205	465
3812	Ba <sub>4.2</sub> Nd <sub>9.2</sub> Ti <sub>18</sub> O <sub>54</sub>	1500	Tungsten Bronze	88.0	8315	3.4	76	1566
3813	Li <sub>0.2</sub> Nd <sub>0.6</sub> TiO <sub>3</sub>	1450		88.0	2400		–210	1585
3814	Pb <sub>0.46</sub> Ca <sub>0.54</sub> [(Fe <sub>1/2</sub> Nb <sub>1/2</sub> ) <sub>0.95</sub> Sn <sub>0.05</sub> O <sub>3</sub>	1150/3h	Perovskite Orthorhombic	88.2	6100		7	1497
3815	Ba <sub>6-3x</sub> (La <sub>1-y-z</sub> Sm <sub>y</sub> Bi <sub>z</sub> ) <sub>8+2x</sub> Ti <sub>18</sub> O <sub>54</sub> (x=2/3, y=0.7, z=0.04)	1350/3h	Tungsten Bronze	88.4	6690	4.4	1	1571
3816	0.05Pb(Fe <sub>2/3</sub> W <sub>1/3</sub> )O <sub>3</sub> -0.95Pb <sub>0.4</sub> Ca <sub>0.6</sub> (Fe <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1000	Perovskite	88.4	3800		–6	1480
3817	Ba <sub>4</sub> (Sm <sub>0.85</sub> Bi <sub>0.15</sub> ) <sub>9+1/3</sub> Ti <sub>18</sub> O <sub>54</sub>	1360	Tungsten Bronze Orthorhombic	88.9	6620		–20	1568
3818	Ba(Nd <sub>0.82-z</sub> Sm <sub>2</sub> Bi <sub>0.18</sub> )Ti <sub>4</sub> O <sub>12</sub> (z=0.7)	1300/2h	Tungsten Bronze	89.0	6880	4.5		1586
3819	(Pb <sub>0.45</sub> Ca <sub>0.55</sub> )[(Fe <sub>0.5</sub> Nb <sub>0.5</sub> ) <sub>0.9</sub> Sn <sub>0.1</sub> ]O <sub>3</sub> + 5 wt% BiO <sub>3</sub> -LiF	950	Perovskite Orthorhombic	89.0	800		–15	1587
3820	0.2CaTiO <sub>3</sub> -0.5(Li <sub>1/2</sub> Nd <sub>1/2</sub> )TiO <sub>3</sub> -0.3(Dy <sub>1/3</sub> Nd <sub>1/3</sub> )TiO <sub>3</sub>	1350/3h	Tetragonal P-4b2 Perovskite	89.4	4650		–87	1498
3821	(Ni <sub>1/3</sub> Nb <sub>2/3</sub> ) <sub>1-x</sub> Ti <sub>x</sub> O <sub>2</sub> (x=0.6)	1200	Rutile Tetragonal P4 <sub>2</sub> /mmm	89.4	12800		193	1276
3822	Ba <sub>6-3x</sub> (Nd <sub>1-y</sub> Bi <sub>y</sub> ) <sub>8+2x</sub> Ti <sub>18</sub> O <sub>54</sub> (x=2/3, y=0.04)	1340/3h	Tungsten Bronze Orthorhombic	89.6	7700	4.0	21	1588
3823	Ba <sub>6-3x</sub> Nd <sub>8+2x</sub> Ti <sub>18</sub> O <sub>54</sub> +PbO/Bi <sub>2</sub> O <sub>3</sub>		Tungsten Bronze	90.0	9000	–	0	1569
3824	BaO-(Nd <sub>0.95</sub> Bi <sub>0.05</sub> ) <sub>2</sub> O <sub>3</sub> -4TiO <sub>2</sub>	1300	Tungsten Bronze type	90.0	7600		33	168

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
3825	0.96La <sub>2/3</sub> TiO <sub>3</sub> -0.04CaTiO <sub>3</sub>		Perovskite Orthorhombic	90.0	27000	10	190	1589
3826	MBRT-90	1300/2h	Composite	90.0	6100		6	510
3827	0.75Bi <sub>2</sub> O <sub>3</sub> -0.25Nb <sub>2</sub> O <sub>5</sub>	900/3h	Flurite $\delta$ -Bi <sub>2</sub> O <sub>3</sub> Fm-3m	90.0	630		60	1396
3828	0.5Sm <sub>1/2</sub> Li <sub>1/2</sub> TiO <sub>3</sub> -0.5Sm <sub>1/2</sub> Na <sub>1/2</sub> TiO <sub>3</sub>	1300	Tetragonal	90.0	1500		-140	1521
3829	BaNd <sub>2</sub> Ti <sub>5</sub> O <sub>14</sub> +25 wt% Nd <sub>2</sub> O <sub>3</sub> +0.5 mol% PbO	1250/2h	Tungsten Bronze Orthorhombic	90.0	6000		-20	1590
3830	Ca <sub>0.61</sub> Nd <sub>0.26</sub> TiO <sub>3</sub> (Sol-gel)	1200	Orthorhomic perovskite Pmna	90.2	25200		243	1591
3831	0.1La(Mg <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> -0.9CaTiO <sub>3</sub>	1500	Perovskite Pbnm	90.4	31900	5.8	-	932
3832	(Pb <sub>1-x</sub> Ca <sub>x</sub> )[Fe <sub>1/2</sub> Nb <sub>1/2</sub> ] <sub>1-y</sub> Zr <sub>y</sub> ]O <sub>3</sub> (y=0.01,x=0.45)	1150	Perovskite	90.6	2500	3.6	41	1488
3833	BaSm <sub>1.8</sub> La <sub>2</sub> Ti <sub>5</sub> O <sub>14</sub>		Orthorhombic Pbam	90.7	8900	-	4	1592
3834	Ba <sub>6-3x</sub> (Nd <sub>(8+2x-y)</sub> Bi <sub>y</sub> )Ti <sub>18</sub> O <sub>54</sub> (x=2/3, y=0.1)	1360	Tungsten Bronze Orthorhombic	90.7	7020		24	1568
3835	(Pb <sub>0.5</sub> Ca <sub>0.5</sub> ) <sub>0.92</sub> La <sub>0.08</sub> (Fe <sub>0.5</sub> Nb <sub>0.5</sub> )O <sub>3</sub>	1190/ 2.5h	Perovskite	90.8	5800		15	1593
3836	(Ca <sub>0.61</sub> Nd <sub>0.26</sub> )(Ti <sub>0.98</sub> Sn <sub>0.2</sub> )O <sub>3</sub> - 0.6(Li <sub>0.5</sub> Nd <sub>0.5</sub> )TiO <sub>3</sub> +5 wt% H <sub>3</sub> BO <sub>3</sub> -CuO+0.5 wt% Li <sub>2</sub> CO <sub>3</sub>	900	Composite	90.8	3400		9	1594
3837	Ba <sub>6-x</sub> Sm <sub>8+2x</sub> Ti <sub>18</sub> O <sub>54</sub> (x=0.5) hot pressed	1300	Tungsten Bronze Orthorhombic	91.0	10870		3	1574
3838	Bi <sub>3</sub> NbO <sub>7</sub>		Cubic flurite type Fm-3m	91.0	730		100	1595
3839	(Pb <sub>0.5</sub> Ca <sub>0.5</sub> ) <sub>0.92</sub> La <sub>0.08</sub> (Fe <sub>0.5</sub> Nb <sub>0.5</sub> )O <sub>3</sub> +1 wt% Bi <sub>2</sub> O <sub>3</sub> -MnO <sub>2</sub>	1050/4h	Perovskite+Pyrochlore	91.1	4870		19	1593
3840	Ba <sub>4</sub> Sm <sub>6.33</sub> Li <sub>3</sub> Ti <sub>18</sub> O <sub>54</sub>	1400	Tungsten Bronze Orthorhombic	91.3	3990	4.4	111	1567
3841	0.3Pb(Fe <sub>2/3</sub> W <sub>1/3</sub> )O <sub>3</sub> - 0.7Pb <sub>0.2</sub> Ca <sub>0.8</sub> (Fe <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1000	Perovskite	91.3	1650		7	1480
3842	(Li <sub>1/2</sub> Pr <sub>1/2</sub> )TiO <sub>3</sub>		Perovskite	92.0	1010		403	1564
3843	Ba <sub>4.5</sub> Nd <sub>9</sub> Ti <sub>18</sub> O <sub>54</sub> +15mol% Ba <sub>4.5</sub> Gd <sub>9</sub> Ti <sub>18</sub> O <sub>54</sub>	1350/10h	Tungsten Bronze	92.0	5000		0	1596
3844	0.75Bi <sub>2</sub> O <sub>3</sub> -0.25Nb <sub>2</sub> O <sub>5</sub>	850/3h	Flourite $\delta$ -Bi <sub>2</sub> O <sub>3</sub> Fm-3m	92.0	720		96	1396
3845	(Ca <sub>0.3</sub> Li <sub>0.14</sub> Sm <sub>0.42</sub> )TiO <sub>3</sub>	1350	Perovskite Orthorhombic	92.1	8292		2.6	719

3846	$\text{Ba}_{6-3x}(\text{Nd}_{1-y}\text{Bi}_y)_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ , $y=0.08$ )		Tungsten Bronze Orthorhombic	92.3	6460	4	10	1588
3847	$\text{Ba}_4\text{Sm}_{3.33}\text{Li}_6\text{Ti}_{18}\text{O}_{54}$	1350	Tungsten Bronze Orthorhombic	92.4	3580	4.4	303	1567
3848	$\text{Ba}_4(\text{Sm}_{0.8}\text{Bi}_{0.2})_{9+1/3}\text{Ti}_{18}\text{O}_{54}$	1360	Tungsten Bronze Orthorhombic	92.4	5680		-12	1568
3849	$\text{Ca}_{2/5}\text{Sm}_{2/5}\text{TiO}_3\text{-Li}_{1/2}\text{Sm}_{1/2}\text{TiO}_3\text{-}0.8\text{TiO}_2$	1300/2h		92.5	4900	4	9	1597
3850	$(\text{Pb}_{0.45}\text{Ca}_{0.55})(\text{Fe}_{0.5}\text{Nb}_{0.5})\text{O}_3$	1100/3h	Perovskite	92.6	5970			996
3851	$\text{Ba}_4\text{Sm}_{7.33}\text{Li}_2\text{Ti}_{18}\text{O}_{54}$	1400	Tungsten Bronze Orthorhombic	92.7	3720	4.4	89	1567
3852	$\text{CaCu}_{2.85}\text{Mn}_{0.15}\text{Ti}_4\text{O}_{12}$	1100	Cubic Im3m	93.0	3950	3.95	657	1598
3853	$\text{Pb}_{0.5}\text{Ca}_{0.5}(\text{Li}_{1/4}\text{Nb}_{3/4})\text{O}_3$		Perovskite	93.0	2000	3.2	630	996
3854	$\text{Ba}_{4.2}(\text{Sm}_{0.5}\text{La}_{0.5})_{9.2}\text{Ti}_{18}\text{O}_{54}$	1500	Tungsten Bronze Orthorhombic	93.0	1300	3.3	118	1569
3855	$\text{Ca}_{1-x}\text{Nd}_{2x/3}\text{TiO}_3$ ( $x=0.42$ )	1400	Perovskite Orthorhombic	93.0	6940	7	228	1599
3856	$0.95\text{TiO}_2\text{-}0.05\text{Bi}_2\text{Ti}_4\text{O}_{11}$		Composite	93.0	12500		230	1372
3857	$\text{BaO-(Nd}_{1-x}\text{Bi}_x)_2\text{O}_3\text{-}4\text{TiO}_2$ ( $x=0.1$ )	1300	Tungsten Bronze	93.0	5900		15	168
3858	$\text{Ba}_{6-3x-z}\text{Sr}_z\text{Nd}_{8+2xy}\text{Bi}_y\text{Ti}_{18}\text{O}_{54}$ ( $y=0.5$ , $x=0.5$ )		Tungsten Bronze Orthorhombic	93.4	5700		40	1582
3859	$(\text{Pb}_{0.48}\text{Ca}_{0.52})\text{Fe}_{1/2}\text{Nb}_{1/2})_{0.9}\text{Sn}_{0.1}\text{O}_3$	1150/3h	Perovskite Orthorhombic	93.6	7100		18	1600
3860	$\text{Ba}_4(\text{Nd}_{0.85}\text{Bi}_{0.15})_{9.33}\text{Ti}_{18}\text{O}_{54}$	1380	Tungsten Bronze Orthorhombic	93.7	6350		17	1568, 1601
3861	$(\text{Pb}_{0.48}\text{Ca}_{0.52})(\text{Fe}_{1/2}\text{Nb}_{1/2})\text{O}_3\text{+}2.2\text{ mol\% CeO}_2$	119/2.5h	Perovskite	93.7	6770		2	1600
3862	$\text{Ba}_{6-3x}[\text{Nd}_{(8+2x)-y}\text{Bi}_y]\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ , $y=0.15$ )	1360	Tungsten Bronze Orthorhombic	93.7	6350		17	1568
3863	$\text{Ba}_{6-3x}(\text{La}_{1-y-z}\text{Sm}_y\text{Bi}_{0.04})_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ , $y=0.5$ , $z=0.5$ )	1340/3h	Tungsten Bronze Orthorhombic	93.9	4337	4	29	1571
3864	$\text{Pb}_{0.6}\text{Ca}_{0.4}\text{ZrO}_3$	1450	Perovskite	94.0	3600	3	-10	1514, 1602
3865	$\text{Pb}_{0.6}\text{Ca}_{0.4}(\text{Ni}_{1/3}\text{Nb}_{2/3})\text{O}_3$		Perovskite	94.0	3800	3.2	130	996
3866	$3\text{SrO-Ta}_2\text{O}_5\text{-}3\text{TiO}_2$	1400/5h	Composite	94.0	5200			53
3867	$(\text{Pb}_{0.6}\text{Ni}_{0.4})(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$		Perovskite	94.0	3800		130	996
3868	$\text{CaO-Sm}_2\text{O}_3\text{-Li}_2\text{O-TiO}_2\text{+}1\text{ wt\% Li}_2\text{O-Bi}_2\text{O}_3\text{-TiO}_2$	1400		94.0	6000		7	1603
3869	$\text{Pb}_{0.48}\text{Ca}_{0.52}[(\text{Fe}_{1/2}\text{Nb}_{1/2})_{0.95}\text{Sn}_{0.05}\text{O}_3]$	1150/3h	Perovskite Orthorhombic	94.3	5950		24	1497

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No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
3870	$\text{Ca}_{1-x}\text{Sm}_{2x/3}\text{TiO}_3$ ( $x=0.6$ )	1450	Perovskite, Orthorhombic	94.5	14900	5		1604
3871	$\text{CaO-BaO-Li}_2\text{O-Sm}_2\text{O}_3\text{-TiO}_2$ (14:4:9:12:63)	1325		94.5	7400		3	1605
3872	$\text{Ba}_{6-3x}\text{Nd}_{8+2x}\text{Ti}_{18}\text{O}_{54}$ $x=0.5+10$ wt% $\text{Bi}_4\text{Ti}_3\text{O}_{12}$	1300/3h	Tungsten Bronze	94.9	5620		21	1606
3873	$\text{Ba}_{6-3x}\text{Pr}_{8+2x}\text{Ti}_{18}\text{O}_{54}$		Tungsten Bronze Orthorhombic	95.0	6000	–	200	1607, 1608
3874	$\text{Ba}_4\text{Sm}_{5.33}\text{Li}_4\text{Ti}_{18}\text{O}_{54}$	1350	Tungsten Bronze Orthorhombic	95.0	1000	4.4	142	1567
3875	$\text{Ba}_{6-3x}(\text{La}_{1-y-z}\text{Sm}_y\text{Bi}_z)_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ , $y=0.5$ , $z=.08$ )	1320/3h	Tungsten Bronze Orthorhombic	95.0	3510	3.8	3	1571
3876	$0.3(\text{Sm}_{1/2}\text{Li}_{1/2})\text{TiO}_3\text{-}0.7(\text{Sm}_{1/2}\text{Na}_{1/2}\text{Ti})\text{O}_3$	1350	Tetragonal	95.0	1000	10		1521
3877	$0.98\text{TiO}_2\text{-}0.02\text{Bi}_2\text{Ti}_4\text{O}_{11}$	1200	Composite	95.0	18000		351	1372
3878	$(\text{Ba}_{0.6}\text{Pb}_{0.4})_{6-3x}\text{La}_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=1.5$ )	1380	Tungsten Bronze Orthorhombic	95.0	6000		200	1566
3879	$0.3\text{Sm}_{1/2}\text{Li}_{1/2}\text{TiO}_3\text{-}0.7\text{Sm}_{1/2}\text{Na}_{1/2}\text{TiO}_3$	1300	Perovskite	95.0	1000		–240	1521
3880	$\text{Pb,Ca(Fe, W, Nb)O}_3$	1000	Perovskite	95.7	3840		10	1480
3881	$0.67\text{Ca}_{2/5}\text{Sm}_{2/5}\text{TiO}_3\text{-}0.33\text{Li}_{1/2}\text{Sm}_{1/2}\text{TiO}_3$	1300/3h	Perovskite	95.5	7200		0	1548
3882	$\text{Ba}_{6-3x}(\text{Nd}_{1-y}\text{Bi}_y)_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ , $y=0.12$ )		Tungsten Bronze Orthorhombic	95.8	5820	4	8	1588
3883	$\text{Ba}_{6-x}\text{Sm}_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=0.3$ ) hot pressed	1300	Tungsten bronze	96.0	1440		–14	1574
3884	$\text{CaO-BaO-Li}_2\text{O-Sm}_2\text{O}_3\text{-TiO}_2$ (14:4:8:12:63)	1325		96.0	7580		–6	1609
3885	$0.92\text{Ba}_{4.5}(\text{Nd}_{1-y}\text{Bi}_y)_9\text{Ti}_{18}\text{O}_{54}\text{-}$ $0.08\text{BaTi}_4\text{O}_9$ ( $y=0.12$ )		Tungsten Bronze Orthorhombic	96.0	5590		27	1610
3886	$0.4\text{Ca}_{0.6}\text{Sm}_{0.8/3}\text{TiO}_3\text{-}0.6(\text{Li}_{0.5}\text{Nd}_{0.5})$ $\text{TiO}_3\text{+}3$ wt% $\text{BaCu(B}_2\text{O}_5)$	1100	Perovskite Orthorhombic	96.3	3100		–20	1611
3887	$\text{CaO-SrO-Li}_2\text{O-}0.83\text{Sm}_2\text{O}_3\text{-}0.17\text{Yb}_2\text{O}_3$ $\text{TiO}_2$		Perovskite Orthorhombic	96.4	2690	–	36	1612
3888	$\text{Ba}_{6-3x-z}\text{Sr}_z\text{Nd}_{8+2x-y}\text{Bi}_y\text{Ti}_{18}\text{O}_{54}$ ( $y=1$ , $x=0.5$ )		Tungsten Bronze Orthorhombic	97.0	5500		22	1582
3889	$\text{Sr}(\text{Bi}_{1-x}\text{Nd}_x)_8\text{Ti}_7\text{O}_{27}$ ( $x=0.1$ )			97.0	740			1583

3890	0.3CaTiO <sub>3</sub> -0.4(Li <sub>1/2</sub> Nd <sub>1/2</sub> )TiO <sub>3</sub> - 0.3(Dy <sub>1/3</sub> Nd <sub>1/3</sub> )TiO <sub>3</sub>	1350/3h	Orthorhombic Pbnm Perovskite	97.6	5150		0	1498
3891	0.98TiO <sub>2</sub> -0.019Bi <sub>2</sub> O <sub>3</sub>		Mixture phases	97.8	3700		354	1434
3892	TiO <sub>2</sub> +2 wt% CuO	900/2h	Tetragonal rutile	98.0	14000		374	1613
3893	0.92Ba <sub>4.5</sub> (Nd <sub>1-y</sub> Bi <sub>y</sub> ) <sub>9</sub> Ti <sub>18</sub> O <sub>54</sub> - 0.08BaTi <sub>4</sub> O <sub>9</sub> (y=0.145)		Tungsten Bronze Orthorhombic	98.0	5500		17	1610
3894	Ca <sub>1-x</sub> Nd <sub>2x/3</sub> TiO <sub>3</sub> (x=0.39)	1400	Perovskite Orthorhombic	98.0	8560	7	247	1599
3895	(1-x)Ca <sub>2/5</sub> Sm <sub>2/5</sub> TiO <sub>3</sub> -xLi <sub>1/2</sub> Nd <sub>1/2</sub> TiO <sub>3</sub> (x=0.3)	1300/3h	Perovskite Orthorhombic	98.0	5100	5		1614
3896	0.75Bi <sub>2</sub> O <sub>3</sub> -0.25Nb <sub>2</sub> O <sub>5</sub>	930/3h	Flourite δ-Bi <sub>2</sub> O <sub>3</sub> Fm-3m	98.0	300		-154	1396
3897	(Nd <sub>1/2</sub> Na <sub>1/2</sub> )TiO <sub>3</sub>		Perovskite Orthorhombic	98.0	2700		190	1615
3898	Ca(Zr <sub>x</sub> Ti <sub>1-x</sub> )O <sub>3</sub> (x=0.4)	1430/15h		98.0	5400	2.49	792	916
3899	Bi <sub>2</sub> (Zn <sub>1-x</sub> Mg <sub>x</sub> ) <sub>2/3</sub> Nb <sub>4/3</sub> O <sub>7</sub> (x=0.5)	900	Monoclinic+cubic	98.0	3000			1616
3900	(Ca <sub>0.275s</sub> Sm <sub>0.4</sub> Li <sub>0.25</sub> )TiO <sub>3</sub> +0.5 wt% B <sub>2</sub> O <sub>3</sub> -Li <sub>2</sub> O	1200/3h	Perovskite Orthorhombic	98.7	5930		-4	1617
3901	CaO-BaO-Li <sub>2</sub> O-Sm <sub>2</sub> O <sub>3</sub> -TiO <sub>2</sub> (14:2:9:12:63)	1325		98.7	6180		8	1605
3902	Ba <sub>4</sub> Sm <sub>(28-y)/3</sub> Li <sub>y</sub> Ti <sub>18</sub> O <sub>54</sub> (y=8)	1300	Tungsten Bronze Orthorhombic	98.8	280		515	1566
3903	Ba <sub>6-3x</sub> (La <sub>1-y-z</sub> Sm <sub>y</sub> Bi <sub>z</sub> ) <sub>8+2x</sub> Ti <sub>18</sub> O <sub>54</sub> (x=2/3, y=0.7, z=0.08)	1325/3h	Tungsten Bronze Orthorhombic	99.0	4920	4.38	-18	1571
3904	0.7Ca <sub>2/5</sub> Sm <sub>2/5</sub> TiO <sub>3</sub> -0.3Li <sub>1/2</sub> Nd <sub>1/2</sub> TiO <sub>3</sub>	1200/3h	Perovskite	99.0	6200		9	1614, 1618
3905	Ba <sub>6-x</sub> Nd <sub>8+2x</sub> Ti <sub>18</sub> O <sub>54</sub> (x=0.3) hot pressed	1300	Tungsten Bronze	99.0	3680		110	1574
3906	(Ca <sub>1-x</sub> Nd <sub>2x/3</sub> )TiO <sub>3</sub> (x=0.6)	1300	Perovskite	99.0	3500	3.2		1619
3907	Sr <sub>2</sub> Ce <sub>2</sub> Ti <sub>5</sub> O <sub>16</sub> (Sr <sub>1-3x/2</sub> Ce <sub>x</sub> TiO <sub>3</sub> x=0.4)+0.4 wt% MoO <sub>3</sub>	1300/2h	Pseudocubic	99.0	9700		306	1620
3908	TiO <sub>2</sub> (microwave sint)	1210	Teragonal	99.0	30800	4.42		1621
3909	Ba <sub>6-3x</sub> (Nd <sub>1-y</sub> Bi <sub>y</sub> ) <sub>8+2x</sub> Ti <sub>18</sub> O <sub>54</sub> (x=2/3, y=0.15)		Tungsten Bronze Orthorhombic	99.1	5290		-6	1588
3910	CaO-SrO-Li <sub>2</sub> O-0.83Sm <sub>2</sub> O <sub>3</sub> -0.17Dy <sub>2</sub> O <sub>3</sub> - TiO <sub>2</sub>		Perovskite Orthorhombic	99.5	5930	-	30	1612

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
3911	$\text{Pb}_{0.5}\text{Ca}_{0.5}[(\text{Fe}_{1/2}\text{Nb}_{1/2})_{0.9}\text{Sn}_{0.1}\text{O}_3$	1150/3h	Perovskite, Orthorhombic	99.6	6570		32	1497
3912	$\text{Sr}_5\text{Ti}_4\text{O}_{13}(\text{Sr}_{n+1}\text{Ti}_n\text{O}_{3n+1})$		Perovskite	99.8	4000	1.9	801	1358
3913	$(\text{Pb}_{1/2}\text{Ca}_{1/2})_{0.94}(\text{La}_{1/2}\text{Nd}_{1/2})_{0.06}$ $[\text{Fe}_{1/2}\text{Nb}_{1/2}]\text{O}_{3+d}$	1200/3h	Perovskite Orthorhombic	99.9	5800	5.5	0	1622
3914	$(\text{Ca}_{1-x}\text{Nd}_{2x/3})\text{TiO}_3$ ( $x=0.5$ )	1300		100.0	14600	3.2		1619
3915	$\text{Ba}(\text{Nd}_{0.82-z}\text{Sm}_z\text{Bi}_{0.18})\text{Ti}_4\text{O}_{12}$ ( $z=0.1$ )	1300/2h	Orthorhombic Tungsten Bronze	100.0	3950	4.7		1586
3916	$[(\text{Pb}_{0.5}\text{Ca}_{0.5})_{0.95}\text{Nd}_{0.05}](\text{Fe}_{1/2}\text{Nb}_{1/2})\text{O}_3$		Perovskite	100.0	5800		0	1623
3917	$\text{CaO-SrO-Li}_2\text{O}-(1-x)\text{Sm}_2\text{O}_3-x\text{Dy}_2\text{O}_3-$ $\text{TiO}_2$ ( $x=0.17$ )			100.0	5900		30	1498
3918	$0.45\text{CaTiO}_3-0.35(\text{Li}_{1/2}\text{Nd}_{1/2})\text{TiO}_3-$ $0.2(\text{Dy}_{1/3}\text{Nd}_{1/3})\text{TiO}_3$	1350/3h	Orthorhombic Pbnm Perovskite	100.1	6430		118	1498
3919	$16\text{CaO-9Li}_2\text{O-12Sm}_2\text{O}_3-63\text{TiO}_2+0.75$ $\text{wt}\% \text{V}_2\text{O}_5$	1200/3h	Composite	100.4	5600		7	1624
3920	$0.05\text{Pb}(\text{Fe}_{2/3}\text{W}_{1/3})\text{O}_3-$ $0.95\text{Pb}_{0.45}\text{Ca}_{0.55}(\text{Fe}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1000	Perovskite	100.8	3250		20	1480
3921	$(\text{Pb,Ca})\text{ZrO}_3$		Perovskite	>100	1000	–	–	1602
3922	$\text{Ba}_{6-3x-z}\text{Pb}_z\text{Nd}_{8+2x-y}\text{Bi}_y\text{Ti}_{18}\text{O}_{54}$ ( $y=1,$ $z=1.0, x=0.5$ )		Tungsten Bronze Orthorhombic	101.0	4000		–4	1582
3923	$\text{Bi}_{1.733}(\text{Zn}_{0.733}\text{Nb}_{4/3})\text{O}_{6.67}$	1000	Cubic	101.0	4800	4.8		1625
3924	$(\text{Pb}_{0.5}\text{Ca}_{0.5})_{0.95}\text{La}_{0.05}(\text{Fe}_{0.5}\text{Nb}_{0.5})\text{O}_3+1$ $\text{wt}\% \text{PbO-B}_2\text{O}_3-\text{V}_2\text{O}_5$	1050/3h	Perovskite Orthorhombic	101.0	5400		6	1626
3925	$0.55\text{Ca}_{0.61}\text{Nd}_{0.91}\text{TiO}_3$ $-0.45\text{Li}_{1/2}\text{Nd}_{1/2}\text{TiO}_3$	1400/4h	Perovskite Orthorhombic	101.0	5300	7.2	13	1599
3926	$\text{Ca}_{1-x}\text{Sm}_{2x/3}\text{TiO}_3$ ( $x=0.4$ )	1450	Perovskite Orthorhombic	101.0	14090	5		1604
3927	$\text{Ca}_{(1-x)}\text{Nd}_{2x/3}\text{TiO}_3$ ( $x=0.21$ )			101.0	8000		–	1545
3928	$\text{CaO-Sm}_2\text{O}_3-\text{Li}_2\text{O-TiO}_2+5 \text{ wt}\%$ $\text{Li}_2\text{O-Bi}_2\text{O}_3-\text{TiO}_2$	1250		101.9	5000		0	1603
3929	$\text{Pb}_{0.5}\text{Ca}_{0.5}[(\text{Fe}_{1/2}\text{Nb}_{1/2})_{0.95}\text{Sn}_{0.05}\text{O}_3$	1150/3h	Perovskite Orthorhombic	102.0	4900		38	1497
3930	$\text{Ba}_{6-x}\text{La}_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=0.7$ ) hot pressed	1300	Tungsten Bronze	102.0	2380		399	1574
3931	$\text{Ba}(\text{Nd}_{0.82-z}\text{Sm}_z\text{Bi}_{0.18})\text{Ti}_4\text{O}_{12}$ ( $z=0.03$ )	1300/2h		102.0	3650	4.74		1586

3932	TiO <sub>2</sub> +0.05 mol% Al <sub>2</sub> O <sub>3</sub>	1500/10h	Tetragonal rutile P4 <sub>2</sub> /mmm	102.0	47100			1628
3933	TiO <sub>2</sub> +0.05 mol% Fe <sub>2</sub> O <sub>3</sub>	1500/10h	Tetragonal rutile P4 <sub>2</sub> /mmm	102.0	50100			1628
3934	TiO <sub>2</sub> +0.05 mol% MnO	1500/10h	Tetragonal rutile P4 <sub>2</sub> /mmm	102.0	48000			1628
3935	TiO <sub>2</sub> +0.05 mol% CuO	1500/10h	Tetragonal rutile P4 <sub>2</sub> /mmm	102.0	48000			1628
3936	TiO <sub>2</sub> +0.05 mol% ZnO	1500/10h	Tetragonal rutile P4 <sub>2</sub> /mmm	102.0	48900			1628
3937	0.1La(Mg <sub>1/2</sub> Ti <sub>1/2</sub> )O <sub>3</sub> -0.9CaTiO <sub>3</sub>	1350	Perovskite	102.5	20200	4.3	395	932
3938	Ba <sub>6-3x</sub> (Nd <sub>1-y</sub> Bi <sub>y</sub> ) <sub>8+2x</sub> Ti <sub>18</sub> O <sub>54</sub> (x=2/3, y=0.18)		Tungsten Bronze Orthorhombic	102.6	4400	4	-17	1588
3939	[(Pb <sub>0.5</sub> Ca <sub>0.5</sub> ) <sub>0.95</sub> La <sub>0.05</sub> ][Fe <sub>0.5</sub> Nb <sub>0.5</sub> ) <sub>1-y</sub> Ti <sub>y</sub> ]O <sub>3+d</sub> (y=0)	1250	Perovskite Orthorhombic	102.8	5900		7	1593
3940	CaO-BaO-Li <sub>2</sub> O-Sm <sub>2</sub> O <sub>3</sub> -Nd <sub>2</sub> O <sub>3</sub> -TiO <sub>2</sub> (14:4:8:10:2:63)	1350	Composite	103.0	7200		2	1612
3941	0.4CaTiO <sub>3</sub> -0.5(Li <sub>1/2</sub> Nd <sub>1/2</sub> )TiO <sub>3</sub> -0.1(Dy <sub>1/3</sub> Nd <sub>1/3</sub> )TiO <sub>3</sub>	1350/3h	Orthorhombic Pbnm Perovskite	103.0	4214		146	1498
3942	Ca <sub>1-x</sub> Nd <sub>2x/3</sub> TiO <sub>3</sub> (x=0.39)	1350	Perovskite Orthorhombic Pnma	103.0	15340		247	1629
3943	(1-x)Li <sub>1/2</sub> Sm <sub>1/2</sub> TiO <sub>3</sub> -xNaNbO <sub>3</sub> (x=0.1)			103.0	2120		-3	1630
3944	Na <sub>0.5</sub> Sm <sub>0.5</sub> TiO <sub>3</sub> +0.6 wt% CeO <sub>2</sub>	1425/2h	Orthorhombic perovskite	103.0	9600		193	1627
3945	Ba <sub>4</sub> (Sm <sub>0.7</sub> Bi <sub>0.3</sub> ) <sub>9+1/3</sub> Ti <sub>18</sub> O <sub>54</sub>	1320	Tungsten Bronze Orthorhombic	103.3	2980		9	1568
3946	(Pb <sub>1/2</sub> Ca <sub>1/2</sub> ) <sub>0.95</sub> La <sub>0.05</sub> [Fe <sub>1/2</sub> Nb <sub>1/2</sub> ]O <sub>3+δ</sub>	1150	Perovskite	103.4	5640		7	1622
3947	Pb <sub>0.5</sub> Ca <sub>0.5</sub> (Fe <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>		Perovskite	104.0	4000	2.8	26	996
3948	TiO <sub>2</sub>	1200	Tetragonal rutile	104.0	44000		-	53, 1631
3949	Sr(Bi <sub>1-x</sub> Nd <sub>x</sub> ) <sub>8</sub> Ti <sub>7</sub> O <sub>27</sub> (x=0.3)			104.0	350			1583
3950	TiO <sub>2</sub> +0.05 mol% Fe	1500	Rutile P4 <sub>2</sub> /mmm	104.0	50300			1631
3951	CaO-Li <sub>2</sub> O-Sm <sub>2</sub> O <sub>3</sub> -TiO <sub>2</sub> (16:9:12:63)	1325		104.1	4320		13	1564, 1605
3952	Ba <sub>6-3x</sub> La <sub>8+2x</sub> Ti <sub>18</sub> O <sub>54</sub>		Tungsten bronze	105.0	2000	-	450	1606, 1607
3953	5BaO-Ta <sub>2</sub> O <sub>5</sub> -3TiO <sub>2</sub>	1400/5h	Composite	105.0	800			53
3954	0.5Ca <sub>0.6</sub> La <sub>0.2667</sub> TiO <sub>3</sub> -0.5Li <sub>1/2</sub> Nd <sub>1/2</sub> TiO <sub>3</sub>	1400/4h	Perovskite Cubic	105.0	7000		5	1632
3955	Ba(Nd <sub>0.82-z</sub> Sm <sub>z</sub> Bi <sub>0.18</sub> )Ti <sub>4</sub> O <sub>12</sub> (z=0.12)	1300/2h	Tungsten Bronze	105.0	4150	3.64		1586

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No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
3956	$\text{Ba}_{6-3x}(\text{La}_{1-y-z}\text{Sm}_y\text{Bi}_z)_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ , $y=0.7$ , $z=0.12$ )	1325/3h	Tungsten Bronze Orthorhombic	105.1	4170	4.59	-15	1571
3957	$0.45\text{CaTiO}_3\text{-}0.45(\text{Li}_{1/2}\text{Nd}_{1/2})\text{TiO}_3\text{-}0.1(\text{Dy}_{1/3}\text{Nd}_{1/3})\text{TiO}_3$	1350/3h	Orthorhombic Pbnm Perovskite	105.1	5160		155	1498
3958	$0.7\text{BaTiO}_3\text{-}0.3\text{La}(\text{Mg}_{1/2}\text{Ti}_{1/2})\text{O}_3$		Perovskite Pm3m	105.8	6940	4.55	525	933
3959	$\text{BaO}\text{-(Nd}_{0.8}\text{Bi}_{1.2})_2\text{O}_3\text{-}4\text{TiO}_2$	1300	Tungsten Bronze	106.0	4200		8	168
3960	$\text{CaO}:\text{BaO}:\text{Li}_2\text{O}(\text{Sm}_{1-y}\text{Nd}_y)_2\text{O}_3:\text{TiO}_2$ (14:4:8:12:63) ( $y=0.33$ )	1400/3h		106.0	6600		22	1609
3961	$0.3\text{Ca}_{2/5}\text{Sm}_{2/5}\text{TiO}_3\text{-}0.7\text{Li}_{1/2}\text{Nd}_{1/2}\text{TiO}_3$		Perovskite	106.0	3100			1614
3962	$\text{Sr}_2\text{Ce}_2\text{Ti}_5\text{O}_{16}(\text{Sr}_{1-3x/2}\text{Ce}_x\text{TiO}_3$ $x=0.4)+0.4$ wt% NiO	1300/2h	Pseudocubic	106.0	10000		315	1620
3963	$0.5\text{Ca}_{2/5}\text{Sm}_{2/5}\text{TiO}_3\text{-}0.5\text{Li}_{1/2}\text{Nd}_{1/2}\text{TiO}_3$	1300/3h		106.0	3710	5		1614
3964	$\text{Ca}_{1-x}\text{Nd}_{2x/3}\text{TiO}_3$ ( $x=0.3$ )	1400	Perovskite Orthorhombic	107.0	6590	7	316	1599
3965	$\text{Sr}_2\text{Ce}_2\text{Ti}_5\text{O}_{16}(\text{Sr}_{1-3x/2}\text{Ce}_x\text{TiO}_3$ $x=0.4)+0.4$ wt% $\text{In}_2\text{O}_3$	1300/2h	Pseudocubic	107.0	9400		310	1620
3966	$\text{Ca}_{2/5}\text{Sm}_{2/5}\text{TiO}_3\text{-Li}_{1/2}\text{Nd}_{1/2}\text{TiO}_3\text{-}0.6\text{TiO}_2$	1300/2h		107.0	3300	4	0	1597
3967	$\text{CaO-Sm}_2\text{O}_3\text{-Li}_2\text{O-TiO}_2$ (11:8:5:40)	1250		107.2	5700		0	1633
3968	$0.2\text{Pb}(\text{Fe}_{2/3}\text{W}_{1/3})\text{O}_3\text{-}0.8\text{Pb}_{0.4}\text{Ca}_{0.6}(\text{Fe}_{1/2}\text{Nb}_{1/2})\text{O}_3$	930	Perovskite	107.2	3790		48	1480
3969	$\text{CaO-SrO-Li}_2\text{O-Sm}_2\text{O}_3\text{-TiO}_2$		Perovskite Orthorhombic	108.0	5480	-	15	1612
3970	$(\text{Ca}_{1-x}\text{Nd}_{2x/3})\text{TiO}_3$ ( $x=0.39$ )	1300	Perovskite	108.0	17200	3		1619
3971	$\text{Sr}(\text{Bi}_{0.6}\text{Nd}_{0.4})\text{Ti}_7\text{O}_{27}$	1260	Aurivillius type	108.0	2000		-	1583
3972	$\text{Ca}_{0.6}\text{La}_{0.2667}\text{TiO}_3$	1400/4h	Perovskite cubic	109.0	17600	4.5	213	1632
3973	$\text{Ba}_{3.75}\text{La}_{9.5}\text{Ti}_{18}\text{O}_{54}$		Tungsten Bronze Orthorhombic	109.2	1800	3		1536
3974	$0.1\text{Pb}(\text{Fe}_{2/3}\text{W}_{1/3})\text{O}_3\text{-}0.9\text{Pb}_{0.45}\text{Ca}_{0.55}(\text{Fe}_{1/2}\text{Nb}_{1/2})\text{O}_3$	930	Perovskite	109.4	3500		5	1480
3975	$\text{Pb}_{0.63}\text{Ca}_{0.37}\text{ZrO}_3$	1450	Perovskite	110.0	3000	2.8		1514
3976	$0.2\text{CaTiO}_3\text{-}0.2(\text{Li}_{0.5}\text{Nd}_{0.5})\text{TiO}_3$	1300	Perovskite	110.0	2600		-15	1634
3977	$(1-x)\text{Ca}_{2/5}\text{Sm}_{2/5}\text{TiO}_3\text{-}x\text{Li}_{1/2}\text{Nd}_{1/2}\text{TiO}_3$ ( $x=0.6$ )	1300/3h	Perovskite	110.0	3400	5	155	1614

3978	$[(\text{Pb}_{0.5}\text{Ca}_{0.5})_{0.98}\text{Nd}_{0.02}](\text{Fe}_{1/2}\text{Nb}_{1/2})\text{O}_3$		Perovskite	110.0	5800		525	1623
3979	$0.15\text{CaO}-0.01\text{SrO}-0.09\text{Li}_2\text{O}-0.12\text{Sm}_2\text{O}_3-0.63\text{TiO}_2$			110.0	4500	3	8	1564
3980	$0.3\text{CaTiO}_3-0.4(\text{Li}_{1/2}\text{Nd}_{1/2})\text{TiO}_3-0.3\text{La}_{1/3}\text{Nd}_{1/3}\text{TiO}_3$	1350	Perovskite composite	110.0	1400		22	1498
3981	$\text{Ba}_{6-x}\text{La}_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=0.5$ ) hot pressed	1300	Tungsten Bronze Orthorhombic	110.0	2460			1574
3982	$0.2\text{CaTiO}_3-0.5(\text{Li}_{1/2}\text{Nd}_{1/2})\text{TiO}_3-0.3(\text{La}_{1/3}\text{Nd}_{1/3})\text{TiO}_3$	1350/3h	Perovskite composite	110.4	1460		315	1498
3983	$\text{Ba}_2\text{Sr}_2\text{Sm}_2\text{Ti}_{4+x}\text{Ta}_{6-x}\text{O}_{30-x/2}$ ( $x=3$ )	1340/2h		111.0	200	3.3		1635
3984	$[(\text{Ca}_x(\text{La},\text{Nd})_{2/3-2x/3})\text{TiO}_3]$ ( $x=0.9$ )	1350/24h	Tetragonal I4/mcm	111.3	4500		273	1392
3985	$\text{Ba}_{6-3x}(\text{La}_{1-y-z}\text{Sm}_y\text{Bi}_z)_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ , $y=0.5$ , $z=0.12$ )	1320/3h	Tungsten Bronze Orthorhombic	111.3	2470	3.7	-30	1571
3986	$\text{Ba}_{6-3x}(\text{La}_{1-y-z}\text{Sm}_y\text{Bi}_z)_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ , $y=0.7$ , $z=0.16$ )	1300/3h	Tungsten Bronze Orthorhombic	111.4	2530	4.3	-21	1571
3987	$(1-x)\text{Ca}_{0.8}\text{Sr}_{0.2}\text{TiO}_3-x\text{Li}_{0.5}\text{Nd}_{0.5}\text{TiO}_3$ ( $x=0.87$ )		Perovskite Tetragonal	111.6	2000		-3	1636
3988	$[(\text{Pb}_{0.5}\text{Ca}_{0.5})_{0.95}\text{La}_{0.05}][\text{Fe}_{0.5}\text{Nb}_{0.5}]_{1-y}\text{Ti}_y\text{O}_{3+d}$ ( $y=0.05$ )	1250	Perovskite Orthorhombic	111.7	5200		24	1593
3989	$0.6(\text{Na},\text{La})\text{TiO}_3-0.4(\text{Li},\text{Sm})\text{TiO}_3$		Perovskite	112.0	1060		18	1421
3990	$\text{Sr}_2\text{Ce}_2\text{Ti}_5\text{O}_{16}(\text{Sr}_{1-3x/2}\text{Ce}_x\text{TiO}_3-x=0.4)+0.4 \text{ wt\% CeO}_2$	1300/2h	Pseudocubic	112.0	9400		305	1620
3991	$\text{Pb}_{0.95}\text{Ca}_{0.05}\text{ZrO}_3$	1250	Perovskite	112.0	720	2.8	-	1514
3992	$\text{Ba}_{6-3x}\text{Nd}_{8+2x-y}\text{Bi}_y\text{Ti}_{18}\text{O}_{54}$ ( $y=2$ , $x=0.5$ )		Tungsten Bronze Orthorhombic	112.0	3000		25	1582
3993	$\text{CaO}-\text{Sm}_2\text{O}_3-\text{Li}_2\text{O}-\text{TiO}_2+1 \text{ wt\% Li}_2\text{O}-\text{Bi}_2\text{O}_3-\text{TiO}_{20}$	1250		112.1	3600		1	1603
3994	$0.05\text{Pb}(\text{Fe}_{2/3}\text{W}_{1/3})\text{O}_3-0.95\text{Pb}_{0.5}\text{Ca}_{0.5}(\text{Fe}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1000	Perovskite	112.2	2730		52	1480
3995	$\text{CaO}-\text{SrO}-\text{Li}_2\text{O}-0.83\text{Sm}_2\text{O}_3-0.17\text{Nd}_2\text{O}_3-\text{TiO}_2$		Perovskite Orthorhombic	112.5	4900	-	13	1612
3996	$[\text{Ca}_{0.4}(\text{Li}_{1/2}\text{Nd}_{1/2})_{0.6}]\text{TiO}_3$	1350	Perovskite	112.6	4480		8	1464
3997	$\text{Sr}_2\text{Ce}_2\text{Ti}_5\text{O}_{16}(\text{Sr}_{1-3x/2}\text{Ce}_x\text{TiO}_3 \text{ } x=0.4)$	1300/2h	Pseudocubic	113.0	8000		306	1620

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
3998	$\text{Sr}_2\text{Ce}_2\text{Ti}_5\text{O}_{16}(\text{Sr}_{1-3x/2}\text{Ce}_x\text{TiO}_3$ $x=0.4)+0.2$ wt% $\text{La}_2\text{O}_3$	1300/2h	Pseudocubic	113.0	9700		287	1620
3999	$0.3\text{CaTiO}_3-0.7\text{Li}_{1/2}\text{Sm}_{1/2}\text{TiO}_3$	1300/3h	Perovskite Orthorhombic	114.0	3700		12	1637
4000	$\text{Ba}_2\text{Sr}_2\text{Sm}_2\text{Ti}_{4+x}\text{Ta}_{6-x}\text{O}_{30-x/2}$ ( $x=2$ )	1340/2h		114.0	150	3.63		1635
4001	$\text{Ba}_2\text{Sr}_2\text{Sm}_2\text{Ti}_{4+x}\text{Ta}_{6-x}\text{O}_{30-x/2}$ ( $x=2.5$ )	1340/3h		114.0	140		–	1635
4002	$0.25\text{CaTiO}_3-0.75(\text{Li}_{1/2}\text{Nd}_{1/2})\text{TiO}_3+10$ wt% $\text{Bi}_4\text{B}_2\text{O}_9$	1200		114.0	2830		–8	1638
4003	$\text{Ba}_4(\text{Nd}_{0.7}\text{Bi}_{0.3})_{9.33}\text{Ti}_{18}\text{O}_{54}$	1320	Tungsten Bronze Orthorhombic	114.1	2700		44	1568
4004	$\text{CaO-SrO-Li}_2\text{O}-0.83\text{Sm}_2\text{O}_3-$ $0.17\text{Pr}_6\text{O}_{11}\text{O}_3-\text{TiO}_2$		Perovskite Orthorhombic	114.3	4850	–	14	1612
4005	$\text{BaO}-(\text{Nd}_{0.7}\text{Bi}_{0.3})_2\text{O}_3-4\text{TiO}_2$	1275	Tungsten Bronze	115.0	2100		26	168
4006	$\text{TiO}_2$	1000	Rutile	115.0	46000			1639
4007	$0.7(\text{Li}_{1/2}\text{Nd}_{1/2})\text{TiO}_3-0.3(\text{Na}_{1/2}\text{Sm}_{1/2})\text{TiO}_3$		Orthorhombic	115.0	3800		15	1640
4008	$\text{Ba}_{6-3x}(\text{La}_{1-y-z}\text{Sm}_y\text{Bi}_z)_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ , $y=0.5$ , $z=0.15$ )	1300/3h	Tungsten Bronze Orthorhombic	115.4	1884	3.58	–22	1571
4009	$0.3\text{CaTiO}_3-0.4(\text{Li}_{1/2}\text{Nd}_{1/2})\text{TiO}_3-$ $0.3(\text{La}_{1/3}\text{Nd}_{1/3})\text{TiO}_3$	1350/3h	Orthorhombic Pbnm Perovskite	116.0	1675		23	1498
4010	$[(\text{Pb}_{0.5}\text{Ca}_{0.5})_{0.95}\text{La}_{0.05}][\text{Fe}_{0.5}\text{Nb}_{0.5}]_{1-y}\text{Ti}_y]$ $\text{O}_{3+d}$ ( $y=0.1$ )	1200	Perovskite Orthorhombic	116.6	4950	17	17	1576
4011	$0.3(\text{Na}_{1/2}\text{La}_{1/2})\text{TiO}_3-0.7(\text{Li}_{1/2}\text{Sm}_{1/2})\text{TiO}_3$	1300	Perovskite Orthorhombic	117.0	2280	3	–19	1421
4012	$\text{Ba}_{6-3x}(\text{La}_{1-y-z}\text{Sm}_y\text{Bi}_z)_{8+2x}\text{Ti}_{18}\text{O}_{54}$ ( $x=2/3$ , $y=0.7$ , $z=0.2$ )	1275/3h	Tungsten Bronze Orthorhombic	117.0	1780	4.29	–36	1571
4013	$0.6\text{CaTiO}_3-0.1(\text{Li}_{1/2}\text{Nd}_{1/2})\text{TiO}_3-$ $0.3(\text{La}_{1/3}\text{Nd}_{1/3})\text{TiO}_3$	1350/3h	Orthorhombic Pbnm Perovskite	117.0	3950		258	1498
4014	$0.4\text{CaTiO}_3-0.3(\text{Li}_{1/2}\text{Nd}_{1/2})\text{TiO}_3-$ $0.3(\text{La}_{1/3}\text{Nd}_{1/3})\text{TiO}_3$	1350/3h	Orthorhombic Pbnm Perovskite	117.0	2070		119	1498
4015	$\text{CaO-SrO-Li}_2\text{O}-0.83\text{Sm}_2\text{O}_3-0.17\text{Sm}_2\text{O}_3-$ $\text{TiO}_2$		Perovskite Orthorhombic	117.5	4120	–	15	1612
4016	$\text{Ca}(\text{Zr}_{0.4}\text{Ti}_{0.6})\text{O}_3$		Perovskite Orthorhombic	118.0	6400			906
4017	$\text{Pb}_{0.65}\text{Ca}_{0.35}\text{ZrO}_3$	1450	Perovskite	118.0	1260	2.8	29	1514

4018	$\text{Sr}_{5.7}\text{Al}_{0.7}\text{Nb}_{9.3}\text{O}_{30}$	1375	Tetragonal Tungsten Bronze P4bm	118.0	80	3.1		562
4019	$\text{Bi}_{1.5}\text{Zn}_{0.92}\text{Nb}_{1.5}\text{O}_{6.92} + 3 \text{ wt}\%$ (0.81 $\text{MoO}_3$ -0.19 $\text{CuO}$ )	900/4h	Cubic	118.2	1000	2.3		1641
4020	$\text{Ba}_{0.75}\text{Sr}_{0.25}(\text{Nd}_x\text{Bi}_{1-x})_2\text{Ti}_4\text{O}_{12}$ (x=0.75)	1250		118.5	4900		-1	1642
4021	$\text{Ca}_{1-x}\text{Nd}_{2x/3}\text{TiO}_3$ (x=0.2)	1400/4h	Perovskite Orthorhombic	119.0	4200	7.2	433	1599
4022	$\text{Ca}_{1-x}\text{Sm}_{2x/3}\text{TiO}_3$ (x=0.2)	1450/3h	Perovskite Orthorhombic	119.3	12330	5		1604
4023	$(1-x)\text{Li}_{1/2}\text{Sm}_{1/2}\text{TiO}_3$ -x $\text{NaNbO}_3$ (x=0.2)			120.0	2300		9	1630
4024	$\text{Bi}_{1.5}\text{Zn}_{0.92}\text{Nb}_{1.5}\text{O}_{6.92} + 3 \text{ wt}\%$ (0.21 $\text{BaCO}_3$ -0.79 $\text{CuO}$ )	950/4h	Cubic	120.1	1050	2.3		1641
4025	$\text{Ba}_{6-3x}(\text{La}_{1-y-z}\text{Sm}_y\text{Bi}_z)_{8+2x}\text{Ti}_{18}\text{O}_{54}$ (x=2/3, y=0.5, z=0.18)	1300/3h	Tungsten Bronze	120.2	1571	3.8	-15	1571
4026	0.4 $\text{CaTiO}_3$ -0.5 $(\text{Li}_{1/2}\text{Nd}_{1/2})\text{TiO}_3$ - 0.1 $(\text{La}_{1/3}\text{Nd}_{1/3})\text{TiO}_3$	1350/3h	Orthorhombic Pbnm Perovskite	121.3	3040		113	1498
4027	0.45 $\text{CaTiO}_3$ -0.25 $(\text{Li}_{1/2}\text{Nd}_{1/2})\text{TiO}_3$ - 0.3 $(\text{Dy}_{1/3}\text{Nd}_{1/3})\text{TiO}_3$	1350/3h	Orthorhombic Pbnm Perovskite	121.3	3650		109	1498
4028	$(\text{La}_{1/2}\text{Na}_{1/2})\text{TiO}_3$	1300	Cubic perovskite	122.0	9800	3	480	1421
4029	0.15 $\text{CaO}$ -0.011 $\text{SrO}$ -0.09 $\text{Li}_2\text{O}$ - 13 $\text{Sm}_2\text{O}_3$ -0.63 $\text{TiO}_2$			123.0	4150		10.8	1612
4030	0.5 $\text{CaTiO}_3$ -0.4 $(\text{Li}_{1/2}\text{Nd}_{1/2})\text{TiO}_3$ - 0.1 $(\text{La}_{1/3}\text{Nd}_{1/3})\text{TiO}_3$	1350/3h	Orthorhombic Pbnm Perovskite	123.0	4148		136	1498
4031	$\text{Sr}_3\text{Ce}_2\text{Ti}_6\text{O}_{19}(\text{Sr}_{1-3x/2}\text{Ce}_x\text{TiO}_3$ x=0.333)	1350/2h	Pseudocubic	123.0	10000		392	1643
4032	$\text{Ba}_{6-3x}(\text{La}_{1-y-z}\text{Sm}_y\text{Bi}_z)_{8+2x}\text{Ti}_{18}\text{O}_{54}$ (x=2/3, y=0.5, z=0.2)	1300/3h	Tungsten Bronze Orthorhombic	124.5	1430	3.58	-9	1571
4033	0.4 $\text{CaTiO}_3$ -0.6 $\text{Li}_{1/2}\text{Nd}_{1/2}\text{TiO}_3$		Perovskite Orthorhombic	126.0	2600	2.1	127	1644
4034	$\text{Bi}_{1.5}\text{Zn}_{0.92}\text{Nb}_{1.5}\text{O}_{6.92}$	1050/4h		126.2	520	2.4		1495
4035	$\text{Ba}_3\text{La}_3\text{Ti}_5\text{Ta}_5\text{O}_{30}$	1425		126.6	110	3.1	100	1645
4036	$(\text{Pb}_{1-x}\text{Ca}_x)[\text{Fe}_{1/2}\text{Nb}_{1/2}]_{1-y}\text{Zr}_y\text{O}_3$ (y=0.01, x=0.4)	1150	Perovskite	126.7	3630	3	118	1488
4037	x $\text{Bi}_4\text{B}_2\text{O}_9$ -(1-x)(0.2 $\text{CaTiO}_3$ - 0.8 $\text{Li}_{0.5}\text{Nd}_{0.5}\text{TiO}_3$ )		Composite	127.0	2700		-4	287

(continued)



No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
4038	0.2Pb(Fe <sub>2/3</sub> W <sub>1/3</sub> )O <sub>3</sub> - 0.8Pb <sub>0.45</sub> Ca <sub>0.55</sub> (Fe <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	930	Perovskite	127.2	2300		96	1480
4039	0.6CaTiO <sub>3</sub> -0.3(Li <sub>1/2</sub> Nd <sub>1/2</sub> )TiO <sub>3</sub> - 0.1(La <sub>1/3</sub> Nd <sub>1/3</sub> )TiO <sub>3</sub>	1350/3h	Orthorhombic Pbnm Perovskite	128.2	4460		256	1498
4040	0.5(Li <sub>1/2</sub> Nd <sub>1/2</sub> )TiO <sub>3</sub> -0.5(Na <sub>1/2</sub> Nd <sub>1/2</sub> )TiO <sub>3</sub>		Perovskite	130.0	2000		20	1640
4041	0.2CaTiO <sub>3</sub> -0.8Li <sub>0.5</sub> Nd <sub>0.5</sub> TiO <sub>3</sub> +5 wt% Bi <sub>2</sub> Ti <sub>2</sub> O <sub>7</sub>	1300	Perovskite Orthorhombic Pbnm	130.0	2400		20	1646
4042	(La <sub>0.44</sub> Pb <sub>0.33</sub> )TiO <sub>3</sub>	1300	Orthorhombic Ibmm	130.0	5000	3	300	1547
4043	Ba <sub>4</sub> La <sub>2</sub> Ti <sub>4</sub> Ta <sub>6</sub> O <sub>30</sub>	1425		131.8	540	3.47	—	1645
4044	Pb <sub>0.7</sub> Ca <sub>0.3</sub> ZrO <sub>3</sub>	1400	Perovskite	132.0	1800	2.8	86	1514
4045	0.2CaTiO <sub>3</sub> -0.68(Li <sub>1/2</sub> Nd <sub>1/2</sub> )TiO <sub>3</sub> - 0.12(La <sub>1/3</sub> Nd <sub>1/3</sub> )TiO <sub>3</sub>	1350/3h	Tetragonal P-4b2 Perovskite	132.6	1450		-17	1498
4046	Sr <sub>4</sub> Ce <sub>2</sub> Ti <sub>7</sub> O <sub>22</sub>	1325	Pseudocubic perovskite	133.0	11100	2.3		1643
4047	Sr <sub>0.8</sub> Ca <sub>0.2</sub> TiO <sub>3</sub>	1400	Perovskite	133.9	3950	1.62	1534	1222
4048	5CaO-2Nb <sub>2</sub> O <sub>5</sub> -3TiO <sub>2</sub>	1300/5h	Composite	134.0	1500			53
4049	0.8CaTiO <sub>3</sub> -0.2(Li <sub>1/2</sub> Nd <sub>1/2</sub> )TiO <sub>3</sub>		Perovskite	134.0	13800		200	1644
4050	0.5(Ca <sub>0.7</sub> Nd <sub>0.2</sub> )TiO <sub>3</sub> -0.5(Li <sub>1/2</sub> Nd <sub>1/2</sub> )TiO <sub>3</sub>	1150/4h	Composite	134.0	2200		20	1647
4051	Sr <sub>4</sub> Ce <sub>2</sub> Ti <sub>7</sub> O <sub>22</sub> (Sr <sub>1-3x/2</sub> Ce <sub>x</sub> TiO <sub>3</sub> x=0.286)	1350/2h	Pseudocubic perovskite	136.0	10800		428	1643
4052	0.4CaTiO <sub>3</sub> -0.48(Li <sub>1/2</sub> Nd <sub>1/2</sub> )TiO <sub>3</sub> - 0.12(La <sub>1/3</sub> Nd <sub>1/3</sub> )TiO <sub>3</sub>	1350/3h	Perovskite Orthorhombic Pbnm	136.4	2220		122	1498
4053	La <sub>(1-x)/3</sub> Na <sub>x</sub> NbO <sub>3</sub> (x=0.02)	1350.2h	Perovskite	138.0	1700		350	1648
4054	Ca(Zr <sub>x</sub> Ti <sub>1-x</sub> )O <sub>3</sub> (x=0.3)	1430/15h	Perovskite	138.0	4900	2.3	588	906
4055	Ca <sub>0.16</sub> Sr <sub>0.04</sub> Li <sub>0.4</sub> Nd <sub>0.4</sub> TiO <sub>3</sub> +0.75 mol% Li	1270	Perovskite Pnma	138.0	1600		52	1649
4056	0.4CaTiO <sub>3</sub> -0.6(LiNd)TiO <sub>3</sub>		Perovskites	139.0	3250		110	1650
4057	Pb <sub>0.6</sub> Ca <sub>0.4</sub> (Fe <sub>1/2</sub> Nb <sub>1/2</sub> ) <sub>0.95</sub> Sn <sub>0.05</sub> O <sub>3</sub>	1150/3h	Perovskite cubic	139.4	2450		140	1497
4058	PbZrO <sub>3</sub> -CeO <sub>2</sub>	1250/4h	Composite	140.0	2500	3	-1080	1651
4059	0.6PbZrO <sub>3</sub> -0.4Ca(Fe <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>	1250/3h	Perovskite	140.7	1776	3.02	120	1576
4060	(Ca <sub>1-x</sub> Nd <sub>2x/3</sub> )TiO <sub>3</sub> (x=0.15)	1300	Perovskite	141.0	11300	2.77		1619
4061	Ca(Zr <sub>x</sub> Ti <sub>1-x</sub> )O <sub>3</sub> (x=0.2)	1430/15h	Perovskite	141.0	5900	2.14	732	906
4062	(Ca <sub>1-x</sub> Nd <sub>2x/3</sub> )TiO <sub>3</sub> (x=0.27)	1300	Perovskite	141.0	10350	3.07		1619

4063	0.6CaTiO <sub>3</sub> -0.28(Li <sub>1/2</sub> Nd <sub>1/2</sub> )TiO <sub>3</sub> - 0.12(La <sub>1/3</sub> Nd <sub>1/3</sub> )TiO <sub>3</sub>	1350/3h	Perovskite Orthorhombic Pbnm	142.0	3327		283	1498
4064	Sr <sub>5</sub> Ce <sub>2</sub> Ti <sub>8</sub> O <sub>25</sub>	1325	Psuedocubic Perovskite	142.0	11100	2.3		1643
4065	Pb <sub>0.6</sub> Ca <sub>0.4</sub> [(Fe <sub>1/2</sub> Nb <sub>1/2</sub> ) <sub>0.9</sub> Sn <sub>0.1</sub> O <sub>3</sub>	1150/3h	Perovskite Cubic	142.6	2520		130	1497
4066	Sr <sub>5</sub> Ce <sub>2</sub> Ti <sub>8</sub> O <sub>25</sub> (Sr <sub>1-3x/2</sub> Ce <sub>x</sub> TiO <sub>3</sub> x=0.25)	1375/2h	Psuedocubic	143.0	11000		478	1643
4067	Sr <sub>0.8</sub> Ca <sub>0.2</sub> TiO <sub>3</sub>		Perovskite Tetragonal I4/mcm	145.0	4050	1.62	1534	1358
4068	Bi <sub>1.5</sub> Zn <sub>0.92</sub> Nb <sub>1.5</sub> O <sub>6.92</sub> +0.6 wt% V <sub>2</sub> O <sub>5</sub>	850/1h		148.0	120			1495
4069	0.4CaTiO <sub>3</sub> -0.5(LiNd)TiO <sub>3</sub> - 0.1(Bi,Na)TiO <sub>3</sub>		Composite	148.0	2650		123	1650
4070	0.4CaTiO <sub>3</sub> -0.6Li <sub>1/2</sub> Nd <sub>1/2</sub> TiO <sub>3</sub> +15 wt% Bi <sub>2</sub> O <sub>3</sub> -2TiO <sub>2</sub>		Composite	150.0	2200		65	1646
4071	Ca(Zr <sub>x</sub> Ti <sub>1-x</sub> )O <sub>3</sub> (x=0.1)	1410/15h	Perovskite	150.0	5000	2.02	749	906
4072	0.4CaTiO <sub>3</sub> -0.6Li <sub>0.5</sub> Nd <sub>0.5</sub> TiO <sub>3</sub> +10 wt% Bi <sub>2</sub> Ti <sub>2</sub> O <sub>7</sub>	1175		150.0	2400		70	1644
4073	Bi <sub>1.5</sub> ZnNb <sub>1.5</sub> O <sub>7</sub>		Cubic	150.0	300	2.9		1652, 1653
4074	Sr <sub>6</sub> Ce <sub>2</sub> Ti <sub>9</sub> O <sub>28</sub> (Sr <sub>1-3x/2</sub> Ce <sub>x</sub> TiO <sub>3</sub> x=0.222)	1375/2h	Psuedocubic Perovskite	150.0	9600		497	1643
4075	Ca(Zr <sub>0.2</sub> Ti <sub>0.8</sub> )O <sub>3</sub>		Perovskite Orthorhombic	153.0	4400			906
4076	Pb <sub>0.6</sub> Ca <sub>0.4</sub> (Fe <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub>		Perovskite	154.0	1700	2.3	135	996
4077	Sr <sub>7</sub> Ce <sub>2</sub> Ti <sub>10</sub> O <sub>31</sub> (Sr <sub>1-3x/2</sub> Ce <sub>x</sub> TiO <sub>3</sub> x=0.2)	1375/2h	Psuedocubic Perovskite	157.0	9300		544	1643
4078	CaTiO <sub>3</sub>	1400	Orthorhombic Perovskite Pbnm	162.0	1290	1.5	859	1358
4079	0.1Pb(Fe <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> -0.9CaTiO <sub>3</sub>	1200/3h	Perovskite cubic	164.0	6180	2.8	583	1654
4080	Pb <sub>0.75</sub> Ca <sub>0.25</sub> ZrO <sub>3</sub>	1300	Perovskite	167.0	960	2.4	111	1514
4081	Sr <sub>8</sub> Ce <sub>2</sub> Ti <sub>11</sub> O <sub>34</sub> (Sr <sub>1-3x/2</sub> Ce <sub>x</sub> TiO <sub>3</sub> x=0.182)	1375/2h	Psuedocubic Perovskite	167.0	8000		601	1643
4082	PbZrO <sub>3</sub> -CeO <sub>2</sub> -SrTiO <sub>3</sub> -NiO-Nb <sub>2</sub> O <sub>5</sub>	1250/4h		170.0	3600	3	800	1651
4083	Sr <sub>0.1</sub> Ca <sub>0.9</sub> TiO <sub>3</sub>		Orthorhombic Perovskite	170.0	8320	1	931	1358
4084	0.3Pb(Fe <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> -0.7CaTiO <sub>3</sub>	1200/3h	Perovskite Cubic	172.7	810	2.7	392	1654
4085	Sr <sub>9</sub> Ce <sub>2</sub> Ti <sub>12</sub> O <sub>37</sub> (Sr <sub>1-3x/2</sub> Ce <sub>x</sub> TiO <sub>3</sub> x=0.167)	1375/2h	Psuedo Cubic Perovskite	173.0	3000		637	1643
4086	0.4CaTiO <sub>3</sub> -0.4(LiNd)TiO <sub>3</sub> - 0.2(Bi,Na)TiO <sub>3</sub>			174.0	1300		91	1650
4087	KTaO <sub>3</sub>	1340	Cubic Pm3m	177.0	2900	3.6		1655

(continued)

No.	Material	ST (°C)	Crystal structure	$\epsilon_r$	$Qf$ (GHz)	$f_0$	$\tau_f$	Reference
4088	$\text{Sr}_{10}\text{Ce}_2\text{Ti}_{13}\text{O}_{40}$ ( $\text{Sr}_{1.3x/2}\text{Ce}_x\text{TiO}_3$ $x=0.154$ )	1400/2h	Pseudo Cubic Perovskite	179.0	8000		724	1643
4089	$\text{Ca}_{1.8}\text{Sr}_{0.2}\text{Bi}_4\text{Ti}_5\text{O}_{18}$	1175/5h	Orthorhombic	180.0	8000			1656
4090	$\text{Sr}_{0.2}\text{Ca}_{0.8}\text{TiO}_3$		Perovskite	181.0	3900	1.4	991	1358
4091	$\text{Sr}_{11}\text{Ce}_2\text{Ti}_{14}\text{O}_{43}$ ( $\text{Sr}_{1-3x/2}\text{Ce}_x\text{TiO}_3$ $x=0.154$ )	1400/2h	Pseudo Cubic Perovskite	185.0	6000		789	1643
4092	$0.4\text{CaTiO}_3\text{-}0.3(\text{LiNd})\text{TiO}_3\text{-}0.3(\text{Bi,Na})\text{TiO}_3$			204.0	1300		147	1650
4093	$\text{Sr}_{0.4}\text{Ca}_{0.6}\text{TiO}_3$		Perovskite	218.0	7180	1.3	1164	1358
4094	$\text{Ba}_{0.5}\text{Sr}_{0.5}\text{TiO}_3\text{-BaWO}_4$			225.0	580			1657
4095	$\text{Sr}_8\text{Ce}_2\text{PbTi}_{12}\text{O}_{36}$	1300		229.0	4400	2	950	1658
4096	$0.5\text{Pb}(\text{Fe}_{1/2}\text{Nb}_{1/2})\text{O}_3\text{-}0.5\text{CaTiO}_3$	1200/3h	Perovskite Cubic	232.1	870	2.3	433	1654
4097	$\text{Sr}_{0.5}\text{Ca}_{0.5}\text{TiO}_3$		Perovskite Orthorhombic Pbnm	236.0	4120	1.2	1234	1358
4098	$0.4\text{CaTiO}_3\text{-}0.2(\text{LiNd})\text{TiO}_3\text{-}0.4(\text{Bi,Na})\text{TiO}_3$			253.0	740			1650
4099	$\text{Pb}_{1.5}\text{Nb}_2\text{O}_{6.5}$		Cubic	259.0	3010		1239	1659
4100	$\text{Ca}_{0.5}\text{Sr}_{0.5}\text{TiO}_3$	1350	Orthorhombic	260.0	7000		384	1660
4101	$\text{SrTiO}_3$		Cubic perovskite Pm-3m	270.0	3000	2	1500	1358, 1661
4102	$\text{Ag}(\text{Nb}_{1/3}\text{Ta}_{2/3})\text{O}_3\text{+}1 \text{ wt}\% \text{ CuO}$	875	Perovskite Orthorhombic pbcm	271.0	800			1662
4103	$\text{BaTi}_{0.7}\text{Ga}_{0.15}\text{Nb}_{0.15}\text{O}_3$	1500/4h	Perovskite Tetragonal P4mm	275.0	100	2.4		1373
4104	$\text{Ag}(\text{Nb}_{2/4}\text{Ta}_{2/4})\text{O}_3$	1200	Perovskite Pbcm Orthorhombic	285.0	300	2.4		1662
4105	$\text{Ag}(\text{Nb}_{1/4}\text{Ta}_{3/4})\text{O}_3$	925	Perovskite Pbcm	295.0	600	2.6		1662
4106	$\text{Sr}_7\text{Ce}_2\text{Pb}_2\text{Ti}_{12}\text{O}_{37}$	1250		301.0	4300	1.8	1287	1658
4107	$40 \text{ wt}\% \text{ Ba}_{0.6}\text{Sr}_{0.4}\text{TiO}_3\text{-}60 \text{ wt}\% \text{ BaZn}_6\text{Ti}_6\text{O}_{19}$	1300	Composite	324	400			1663
4108	$0.8\text{PbZrO}_3\text{-}0.2\text{Ca}(\text{Fe}_{1/2}\text{Nb}_{1/2})\text{O}_3$	1250/3h	Perovskite Rhombohedral	335.8	314	2	386	1576
4109	$\text{Bi}_6\text{Ti}_5\text{TeO}_{22}$	1010/10h		350.0	220		2600	1131

4110	Ba <sub>0.2</sub> Sr <sub>0.8</sub> TiO <sub>3</sub>	1450/3h	Cubic perovskite	363.0	2400	2.3		1664
4111	Ba <sub>0.3</sub> Sr <sub>0.7</sub> TiO <sub>3</sub> -10 mol% MgTiO <sub>3</sub>	1350	Cubic perovskite	365.0	1500			1665
4112	AgTa <sub>0.57</sub> Nb <sub>0.43</sub> O <sub>3</sub>	1200	Perovskite	380.0	800			1666
4113	Ag(Nb <sub>2/4</sub> Ta <sub>2/4</sub> )O <sub>3</sub> +1 wt% CuO	900	Perovskite	398.0	400	2.3		1662
4114	Ag <sub>0.52</sub> Ta <sub>0.48</sub> O <sub>3</sub>	1250/20h	Perovskite, Monoclinic P2/m	415.0	430	2		1667
4115	Ba <sub>0.5</sub> Sr <sub>0.5</sub> TiO <sub>3</sub>		Perovskite	420.0	2250			1358
4116	Sr <sub>6</sub> Ce <sub>2</sub> Pb <sub>3</sub> Ti <sub>12</sub> O <sub>36</sub>	1200		430.0	2300	1.7	2218	1658
4117	Ba <sub>0.5</sub> Sr <sub>0.5</sub> Ti <sub>1-3y/2</sub> W <sub>y</sub> O <sub>3</sub> (y=0.05)			431.0	365	2.11		1668
4118	Ba <sub>0.4</sub> Sr <sub>0.6</sub> Ti <sub>0.9</sub> Mn <sub>0.1</sub> O <sub>3</sub>	1400/4h	Perovskite	449.0	580			1669
4119	Ag(Nb <sub>3/4</sub> Ta <sub>1/4</sub> )O <sub>3</sub> - Ag(Nb <sub>1/4</sub> Ta <sub>3/4</sub> )O <sub>3</sub> (5:55)	925	Perovskite Orthorhombic	463.0	200	1.97		1662
4120	Ag(Nb <sub>3/4</sub> Ta <sub>1/4</sub> )O <sub>3</sub>	925	Perovskite Orthorhombic Pbcm	487.0	200	1.89		1662
4121	Ba <sub>0.8</sub> Sr <sub>0.2</sub> TiO <sub>3</sub>	1450/3h	Perovskite	560.0	850	1.9		1664
4122	0.7Pb(Fe <sub>1/2</sub> Nb <sub>1/2</sub> )O <sub>3</sub> -0.3CaTiO <sub>3</sub>	1150/3h	Perovskite Cubic	566.0	120	1.42	1075	1654
4123	60 wt% Ba <sub>0.6</sub> Sr <sub>0.4</sub> TiO <sub>3</sub> -40 wt% BaZn <sub>6</sub> Ti <sub>6</sub> O <sub>19</sub>	1300	Composite	584.0	250			1663
4124	Ba <sub>0.4</sub> Sr <sub>0.6</sub> TiO <sub>3</sub>	1450/3h	Perovskite	672.0	1600	1.7		1664
4125	BaTi <sub>0.5</sub> Ga <sub>0.25</sub> Nb <sub>0.25</sub> O <sub>3</sub>	1500/4h	Perovskite Tetragonal P4mm	760.0	40	2.4		1373
4126	Ba <sub>0.6</sub> Sr <sub>0.4</sub> TiO <sub>3</sub>	1450/3h	Perovskite	838.0	300	1.6		1664
4127	Ba <sub>0.4</sub> Sr <sub>0.6</sub> TiO <sub>3</sub>		Perovskite	1038.0	720			1670
4128	Ba <sub>0.6</sub> Sr <sub>0.4</sub> TiO <sub>3</sub> +2 mol% BaCu(B <sub>2</sub> O <sub>5</sub> )		Perovskite	2553.0	330			1671
4129	Ba <sub>0.6</sub> Sr <sub>0.4</sub> TiO <sub>3</sub> +0.5 wt% MgCo <sub>2</sub> (VO <sub>4</sub> ) <sub>2</sub>		Perovskite	2763.0	300	1		1672