Appendix

List of Low-Loss Ceramic Dielectric Materials and Their Properties

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Abbreviations

ST = sintering temperature (°C)
ε_r = relative permittivity
f = measurement frequency (GHz)
τ_f = coefficient of temperature variation of resonant frequency (ppm/°C)
No. = serial number
Qf = quality factor frequency product (GHz)

The table lists the key property data of microwave dielectric materials available from published materials. These data are the relative permittivity (ε_r), the product of the Q-factor and the frequency (Qf), the frequency of measurement (f), and the temperature coefficient of the resonant frequency (τ_f). In tabulating these data, we make no judgment on the measurement method and the reliability of the result. It is known that the ceramic properties such as porosity, grain size, raw materials used, impurities, measurement methods, and equipment used for measurements affect the dielectric properties and readers should be aware that exact comparison of data on materials of identical composition and manufactured in different laboratories using different processing conditions and measured by different methods would be expected to lead to small variations in properties. The data of dielectric measurements carried out using impedance methods at low (MHz) frequency is excluded as the errors in these methods mean that a loss tangent less than 10^{-3} is unreliable. The data are arranged in the order of increasing relative permittivity. The quality factor of the microwave dielectric ceramics decrease significantly with increasing relative permittivity, as shown in Figure A.1. The inset in the figure shows the variation of quality factor frequency product with

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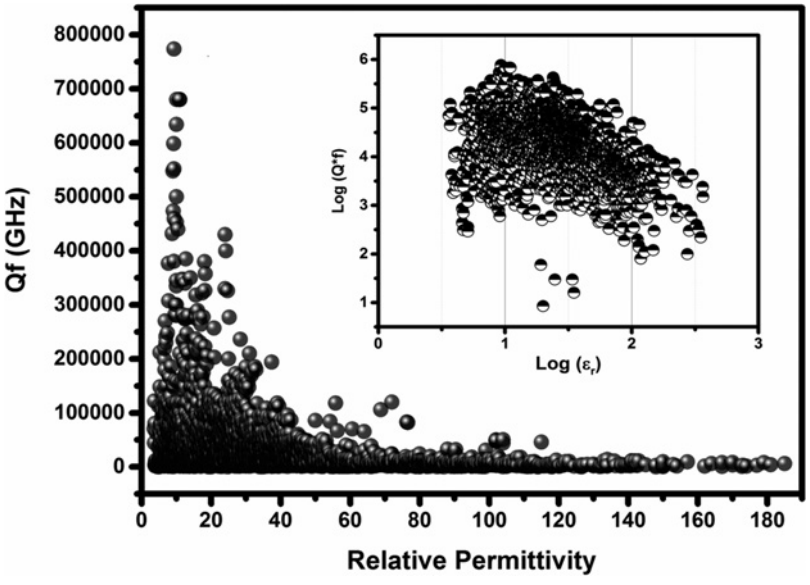

Figure A.1 *Variation of quality factor frequency product as a function of relative permittivity. The inset in the figure shows the variation of quality factor frequency product with relative permittivity in the logarithmic scale.*

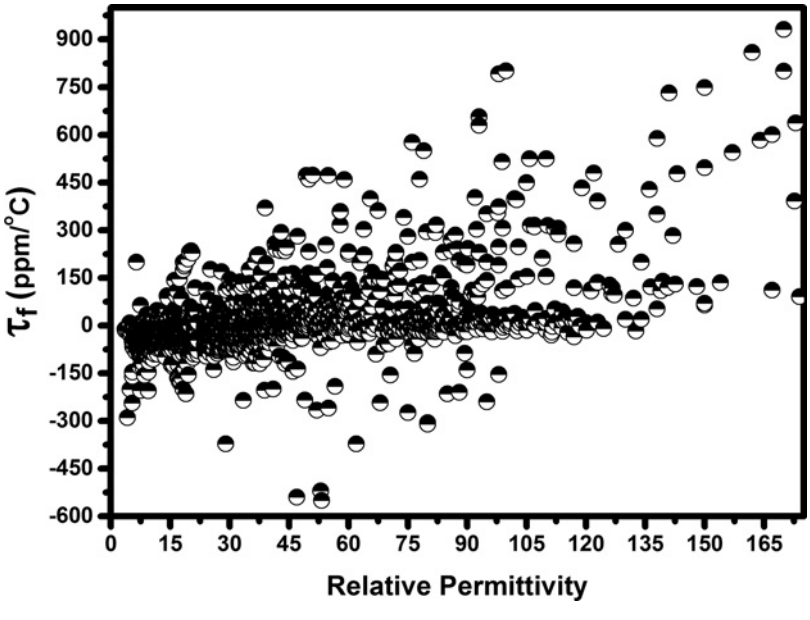

Figure A.2 *Variation of coefficient of temperature variation of resonant frequency in ppm/°C as a function of relative permittivity.*

relative permittivity in the logarithmic scale. The $0.993MgO–0.007B_2O_3$ has the highest Qf ($Qf = 773\,700$ GHz with $\varepsilon_r = 9.3$ and $\tau_f = -55$ ppm/°C). On the other hand, $AlPO_4$ has the lowest relative permittivity wth $\varepsilon_r = 3.0$ and $Qf = 900$ GHz. SiO_2 has $\varepsilon_r = 3.5$ with Qf of 92400 GHz and $\tau_f = -15$ ppm/°C. In general, the low ε_r materials have negative τ_f and high ε_r materials with positive τ_f, as shown in Figure A.2. The DR table is an updated version of the table in Appendix II in *Dielectric Materials for Wireless Communication* by M.T, Sebastian, published by Elsevier in 2008 and the supplementary file by M.T. Sebastian, Rick Ubic, and H. Jantunen, in *International Materials Review*, vol. 60, (2015), p.392. There are several low-loss single crystal materials and the reader is referred to Appendix II in the above referred book.

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
1	$AlPO_4$+5 wt% MgF_2	1450	Orthorhombic	3.0	900	5.8	–	1
2	50%Li_2CO_3-40.24%B_2O_3-9.76%SiO_2	600	glass	3.2	10500		−79	2
3	SiO_2 sol-gel	1550	Tetragonal cristobalite	3.5	92400		−15	3
4	0.2B_2O_3-0.8SiO_2	1100	Amorphous (fused silica)	3.6	70600			4
5	SiO_2 (solid state method)	1100	fused silica	3.7	44300		−15	5
6	SiO_2melt method		Fused silica	3.7	122100			5
7	10.5CaO-22.2B_2O_3-67.3SiO_2	1035	Glass	3.8	4300	12.9		6
8	SiO_2	1650	Trigonal $P3_121$	3.8	80400		−16	7
9	CaO-B_2O_3-SiO_2 (29.3:9.3:61.4 mol%)	900	Glass	3.9	1800	9.9		8
10	27.8CaO-27B_2O_3-45.2SiO_2	875	Glass	4.0	3200	12.8		8
11	$KGaGe_3O_8$	890	Monoclinic $P2_1/a$	4.0	10200	13		9
12	$SrCuSi_4O_{10}$	1100	Gillespite Tetragonal P4/ncc	4.0	11500			10
13	CaO-B_2O_3-SiO_2 (19.8:30.9:49.3 mol%)	900	Glass	4.1	2000	9.9		8
14	CaO-B_2O_3-SiO_2 (10.5:22.2:67.3 mol%)	900	Glass	4.1	2600	9.9		8
15	Na_2MoO_4	660	Cubic Fd-3m	4.1	35000		−76	11
16	$Li_3AlB_2O_6$	650	Triclinic	4.2	12460	16.8	−290	12
17	27.8CaO-27B_2O_3-45.3SiO_2	850	Glass	4.2	3200	12.8		6
18	$LiAlSiO_4$+15 wt% Bi_2O_3	900	α-eucryptite Rhombohedral R3	4.3	62400		−16	13
19	Li_2CaSiO_4	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	$Mg_2Al_4Si_5O_{18}$ 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	$K_{0.9}Ba_{0.1}Ga_{1.1}Ge_{2.9}O_8$	990	Monoclinic C2/m	4.7	10600	13	−18	9
30	$LiAlSiO_4$	1350	α-eucryptite Rhombohedral R3	4.8	36000		8	17

31	$Li_3AlB_2O_6$	700	Triclinic	4.9	12600	16.9	−201	12
32	(cordierite) $Mg_2Al_4Si_5O_{18}$+7 wt% Yb_2O_3	1420	Orthorhombic Cccm	4.9	112500	18		18
33	Li_2MgSiO_4+5 wt% LMZBS	850/2h	Orthorhombic	4.9	8000	8		19
34	Zn_2SiO_4-SiO_2-H_3BO_3 (30:55:15 wt%)	725		4.9	38100	18.49		20
35	$SrCuSi_4O_{10}$+5 wt% LMZBS	900/6h	Tetragonal Gillespite P4/ncc	5.0	4000			10
36	30 wt% Al_2O_3+70 wt% [3ZnO-2B_2O_3]	850	Composite	5.0	8000	7	−32	21
37	Mg_2SiO_4+15 wt% LBS	950	Orthorhombic Pbnm	5.0	1500			22
38	Li_2MgSiO_4+3 wt% LMZBS	850/2h	Orthorhombic	5.0	10000	8		19
39	$SrCuSi_4O_{10}$+3 wt% LMZBS	975/6h	Tetragonal Gillespite P4/ncc	5.1	5000			10
40	Li_2MgSiO_4	1250/2h	Orthorhombic	5.1	16000	8		19
41	Cordierite+15 wt% CaO-B_2O_3	1020	Cordierite composite	5.1	4500	10.3		23
42	Li_2MgSiO_4+3 wt% LBS	850/2h	Orthorhombic	5.1	42100	8		19
43	Li_2MgSiO_4+2 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	$KGaGe_3O_8$+0.3 wt% H_3BO_3	880	Monoclinic $P2_1/a$	5.2	64000	13	−23	9
50	Li_2MgSiO_4+5 wt% LBS	850/2h	Orthorhombic	5.2	12500	8		19
51	Li_2MoO_4	Room Temp	Trigonal R-3	5.2	18500	9.6		24
52	$LiAlSiO_4$+12 mol%B_2O_3	950	α-eucryptite Rhombohedral R3	5.3	212000		−8	17
53	Li_2MgSiO_4 citrate gel method	1175	Orthorhombic	5.3	9000	9		25
54	$K_{0.9}Ba_{0.1}Ga_{1.1}Ge_{2.9}O_8$	910/20h	Monoclinic $P2_1/a$	5.3	148100	13		9
55	$SrCuSi_4O_{10}$+1 wt% LMZBS	1075/6h	Tetragonal Gillespite P4/ncc	5.3	6500			10
56	sillimanite (Al_2SiO_5)	1525		5.3	37500		−17	26
57	$Li_3AlB_2O_6$	775/10h	Triclinic P-1	5.4	20450	17.4	−244	12
58	Li_2MgSiO_4+0.5 wt% LBS	925/2h	Orthorhombic	5.4	80000	8		19
59	40 wt% Al_2O_3+60 wt% (SiO_2-B_2O_3-Al_2O_3)	875	Composite	5.4	8000	–	−50	27

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
60	$0.85SiO_2$-$0.15TiO_2$ core shell structure	1200	Composite	5.4	40500		0	28
61	Zn_2SiO_4-SiO_2-H_3BO_3 (33:59::8 wt%)	825		5.4	48800	17.7		20
62	Zn_2SiO_4-SiO_2-H_3BO_3 (33:59:8 wt%)	875		5.5	40500	17.49		20
63	$NaAlSi_3O_8$ (albite)	1025	Triclinic C-1	5.5	11200		−5	29
64	Li_2MoO_4	540	Trigonal R-3	5.5	46000	13	−160	30
65	Li_2MgSiO_4+1 wt% LBS	925/2h	Orthorhombic	5.5	114300	8		19
66	Li_2MgSiO_4+0.5 wt% LMZBS	925/2h	Orthorhombic	5.5	72700	8		19
67	CaO-SiO_2-B_2O_3+0.5 wt% ZrO_2		Composite	5.5	28500	11.1		31
68	Li_2WO_4	640	Monoclinic C2/c	5.5	62000	15.7	−146	32
69	$K_{0.9}Ba_{0.1}Ga_{1.1}Ge_{2.9}O_8$+0.1 wt% H_3BO_3	910	Monoclinic $P2_1/a$	5.6	10400	13		9
70	Li_2MgSiO_4+1 wt% LMZBS	925/2h	Orthorhombic	5.6	80000	8		19
71	$K_2Mo_3O_{10}$	520	Monoclinic p-1	5.6	39300		−67	33
72	$Zn_{1.8}SiO_{3.8}$+20 mol% B_2O_3	900	Rhombohedral	5.7	53000		−16	34
73	Al_2O_3+50 vol% ZBS glass	900	Composite	5.7	17800	12.6		35
74	$Mg_5TaO_3(BO_3)_3$+1 wt% LiF	1300/2h	Orthorhombic Pnma warwickite	5.7	27000			36
75	$Al_2W_{3-x}Mo_xO_{12}$ (x=1)	810	Orthorhombic Pbcn	5.8	33810		−72	37
76	μ-cordierite+B_2O_3-P_2O_5	860	Composite	5.8	3000		−55	38
77	α-cordierite+B_2O_3-P_2O_5	950	Composite	5.8	6000		−15	38
78	Li_2CaSiO_4+1 wt% ZBS	975	Tetragonal I-42m	5.8	2000			14
79	$K_{0.67}Ba_{0.33}Ga_{1.33}Ge_{2.67}O_8$	1020	Monoclinic C2/m	5.9	94100		−25	39
80	Al_2O_3+MgO-Al_2O_3-SiO_2-GeO_2+ ZnO-B_2O_3	900	Composite	5.9	5590	8.4		40
81	Li_2MgSiO_4+2 wt% LMZBS glass	875/2h	Orthorhombic	5.9	111000	8		19
82	MgO-B_2O_3-SiO_2+10 wt% TiO_2	1050	Composite	5.9	16500			41
83	$0.84SiO_2$- $0.16TiO_2$	1275/3h	Composite	5.9	36700	12.5	−5	42
84	Al_2O_3+50 vol% ZBS glass	800	Composite	6.0	14400	12.5		35
85	$Zn_{2-x}SiO_{4-x}$+25 mol% B_2O_3	900	Composite	6.0	70000		−22	43
86	CaO-B_2O_3-SiO_2	830	Glass	6.0	5000	10		44
87	Al_2O_3+50 vol% ZBS glass	850	Composite	6.0	16950	12.5		35
88	Al_2O_3+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 $P2_1/a$	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	$MgO\text{-}Al_2O_3\text{-}B_2O_3\text{-}SiO_2\text{-}TiO_2$		Composite	6.1	4200			46
93	α- $Mg_2P_2O_7$	1150	Throtveitite type Monoclinic $P2_1/c$	6.1	38180		−746	47
94	$CaWO_4$+0.5 wt% B_2O_3	1050	Sheelite Tetragonal $I4_1/a$	6.1	38100		−47	48,49
95	$(Mg_{0.9}Ni_{0.1})_2Al_4Si_5O_{18}$	1440/2h	Orthorhombic Cccm	6.1	99100		−32	50
96	$MgO\text{-}B_2O_3\text{-}SiO_3$ glass ceramic		Glass	6.1	11300			51
97	$K_{0.6}Ba_{0.4}Ga_{1.4}Ge_{2.6}O_8$	970	Monoclinic $P2_1/a$	6.1	120900	13	−23	9
98	$Mg_2B_2O_5$	1310	Monoclinic $P2_1/c$	6.2	32000		−45	52
99	$KGaGe_3O_8$	970	Monoclinic P21/a	6.2	19800		−21	39
100	$Mg_2Al_4Si_5O_{18}$ cordierite	1440	Orthorhombic Cccm	6.2	40000		−25	38
101	50 wt% Al_2O_3+50 wt% $(SiO_2\text{-}B_2O_3\text{-}Al_2O_3)$	875	Composite	6.2	11400	–	−35	27
102	45 wt% Al_2O_3+55 wt% $(SiO_2\text{-}B_2O_3\text{-}Al_2O_3)$	875	Composite	6.3	11500	–	−33	27
103	$AlSbO_4$	1100/3h	Tetragonal $P4_2/mnm$	6.3	3200	4	–	53
104	$CaO\text{-}B_2O_3\text{-}SiO_2$+4 wt% $La_2O_3\text{-}B_2O_3$	850	Glass	6.3	10000			54
105	$Al_2W_{3-x}Mo_xO_{12}$ (x=0)	1100	Orthorhombic Pbcn	6.3	9600		−67	37
106	$Al_2W_{3-x}Mo_xO_{12}$ (x=2)	810	Orthorhombic Pbcn	6.3	36500		−55	37
107	$0.9Mg_2Al_4Si_5O_{18}\text{-}0.1TiO_2$		Composite	6.3	55400	17.6	−21	55
108	$42.5SiO_2\text{-}21MgO\text{-}20Al_2O_3\text{-}16.5TiO_2$		Composite	6.3	27000	9.7	−6	56
109	$Al_2W_{3-x}Mo_xO_{12}$ (x=3)	810	Monoclinic $P2_1/a$	6.4	49200		−41	37
110	55 wt% Al_2O_3+45 wt% $(SiO_2\text{-}B_2O_3\text{-}Al_2O_3)$	900	Composite	6.4	13000	–	−58	27
111	$Mg_3(VO_4)_2$	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	$Y_2BaCu_{0.75}Ni_{0.25}O_5$		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 $P2_1/a$	6.4	94700	12	−23	39
115	$BaAl_2Si_2O_8$	1475/3h	Hexagonal P6/mmm	6.4	44800		−47	59

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
116	$Ca_{0.99}Mg_{0.01}SiO_3$	1290/2h	Wollastonite Monoclinic $P2_1/a$	6.5	62400		−43	60
117	Mg_2GeO_4+3 wt% B_2O_3	1200/4h	Orthorombic Pnma	6.5	91000		−28	61
118	ZnO-B_2O_3-SiO_2 glass (60.3:27.1:12.6)		Glass	6.5	4500	17.1	−10	35
119	0.3TeO_2-$SnTe_3O_8$	660	Composite	6.5	8800		200	62
120	Li_2CaSiO_4+0.5 wt% BBS	925	Tetragonal I-42m	6.5	5500			14
121	Li_2CaSiO_4+0.5 wt% PBS	925	Tetragonal I-42m	6.5	1500			14
122	0.15ZnO-0.25Nd_2O_3-0.6B_2O_3+ 50 wt% Al_2O_3	850	Composite	6.5	22500	18.9		63
123	$Mg_3B_3O_6$+35 wt% LMBS	950	Composite	6.5	21000		−50	64
124	$(Zn_{1-x}Co_x)_2SiO_4$ (x=0.05)	900	Willimite Rhombic R3	6.5	5700		−55	65
125	$(Zn_{0.095}Co_{0.05})_2SiO_4$+2 wt% Li_2O–B_2O_3–SiO_2–CaO–Al_2O_3	900	Willimite	6.5	57000		−55	66
126	$LiMgPO_4$	950	Orthorhombic Pmnb	6.6	79100		−60	67
127	$(Mg_{0.4}Zn_{0.6})_2SiO_4$		Trigonal R-3	6.6	95650		−60	68
128	Zn_2SiO_4+sol-gel	1325	Trigonal R-3	6.6	198400		−42	69
129	$Sr_2Al_2Si_{0.9}Ge_{0.1}O_7$	1525	Tetragonal Gehhlenite type $P\text{-}42_1m$	6.6	22900		−28	70
130	Al_2O_3+50 vol % ZBS glass	700	Composite	6.6	2600	11.8		35
131	$Ca_{1-x}Sr_xSiO_3$ (x=0.8)		Monoclinic $P2_1/a$	6.6	66700		−40	71
132	MgO-B_2O_3-SiO_2 (42:45:13)		Glass	6.6	2100	6.88		72
133	Willemite (Zn_2SiO_4)	1340	Trigonal R-3	6.6	219000		−61	73
134	$CaWO_4$+1 wt% $MnSO_4$	1050	Scheelite $I4_1/a$	6.6	129540		−56	48,49
135	$K_{0.9}Ba_{0.1}Ga_{1.1}Ge_{2.9}O_8$	990	Monoclinic C2/m	6.6	12700		−21	39
136	$Zn_{1.8}SiO_{3.8}$	1300/3h	WillemiteTrigonal R-3	6.6	147000		−22	74
137	MgO-B_2O_3-SiO_2 (42:45:13) glass		Glass	6.6	2130	6.9		75
138	ZnO-0.6 SiO_2+Bi_2O_3-Li_2CO_3	910/2h	Glass	6.7	33000	11	−33	76
139	CaO-SiO_2	1320	Glass ceramic	6.7	25400			77
140	50 wt% (La_2O_3-B_2O_3))+50 wt% Al_2O_3	850	Glass	6.7	2800	17.7		78
141	$Mg_{1.975}Mn_{0.025}SiO_4$ Fosterite	1400	Orthorhombic Pbnm	6.7	180000		−71	79

142	$MgSiO_3$	1380/13h	Orthorhombic Pbnm	6.7	121200		−17	80
143	$CaSiO_3$+1 wt% Al_2O_3	1250	Wollastonite Monoclinic $P2_1/a$	6.7	24600			81
144	$LiMg_{0.9}Zn_{0.1}PO_4$	925	Orthorhombic Pmnb Olivine type	6.7	99700		−62	82
145	$Zn_3B_2O_6$	925/4h	Triclinic I2/c	6.7	58500		−58	83
146	$(Mg_{0.95}La_{0.05})_2Al_4Si_5O_{18+0.05}$		Orthorhombic	6.7	78500	14.3	−22	84
147	Mg_2SiO_4+15 wt% LMZBS glass	950	Composite	6.8	30600			85
148	$Mg_2B_2O_5$+55 wt% LMZBS glass	950	Composite	6.8	50000	7.28	−64	86
149	Mg_2SiO_4Fosterite	1450	Orthorhombic Pbnm	6.8	270000		−67	87
150	Li_2ZnSiO_4+20 wt% ZnO-B_2O_3	950/3h	Composite	6.8	9300		−51	88
151	Li_2ZnSiO_4+25 wt% ZnO-B_2O_3	950/3h	Composite	6.8	10800		−47	88
152	α-$CaSiO_3$	1500	Monoclinic C2/c wollastonite	6.8	42200		−19	89
153	$SrSiO_3$	1500	Monoclinic C2/c	6.8	13100		−66	89
154	Mg_2GeO_4+B_2O_3	1250	Orthorhombic Pnma	6.8	95000		−29	90
155	$K_2Mo_4O_{13}$	540	Triclinic p-1	6.8	39800		−67	33
156	$0.9Ca_{0.9}Mg_{0.1}SiO_3$-$0.1CaMgSi_2O_6$	1290/2h		6.9	118000			91
157	$Mg_{1.93}Ca_{0.07}SiO_4$ Fosterite	1400	Orthorhombic Pbnm	6.9	105000		−72	79
158	ZnO:B_2O_3 (50:50) glass	<800	Glass	6.9	1733	16.4	−10	92
159	$K_{0.67}Ba_{0.33}Ga_{1.33}Ge_{2.67}O_8$	1020	Monoclinic C2/m	6.9	32600	12	−27	39
160	ZnO:B_2O_3:SiO_2 (50:40:10) glass	611	Glass	6.9	1710	15.8	−21	92
161	$BaGa_2Ge_2O_8$	1100/12h	Monoclinic $P2_1/a$	6.9	10640		−26	39
162	xMgO-(1-x)B_2O_3 (x=0.75)	1350/4h	Orthorhombic Pnmn	6.9	119600		−69	93
163	MgO-B_2O_3-SiO_2+10 wt% TiO_2		Composite	6.9	16500			51
164	3ZnO-B_2O_3	950/1h	Glass	6.9	20600	6.35	−80	94
165	$(Ca_{0.9}Mg_{0.1})SiO_3$+Li_2CO_3-Bi_2O_3	890/2h	Mixed phases	6.9	27000		−40	95
166	16ZnO-16La_2O_3-68B_2O_3+50 wt% Al_2O_3	950	Composite	6.9	12100	18.1	−12	96
167	$Sm_2Si_2O_7$+15 wt% LMZBS	950/2h	Tetragonal $P4_1$	6.9	5000	10		97
168	Zn_2GeO_4	1300	Trigonal R-3	6.9	102700		−32	98
169	$LiMg_{0.95}Ni_{0.05}PO_4$	875	Orthorhombic olivine type	6.9	98600		−55	99

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
170	$(Mg_{0.95}Ni_{0.05})_2SiO_4$+12 wt% Li_2CO_3-V_2O_5	1150/4h	Orthorhombic	6.9	99800		−50	100
171	$HfSiO_4$		Tetragonal amd	7.0	25000	10	−44	101
172	$Sr_{0.05}Ba_{0.95}Al_2Si_2O_8$	1600/162h	Monoclinic celsian I2/c	7.0	92600		−22	102
173	$Mg_3B_2O_6$+5 wt% $Mg_2B_2O_5$	1310/20h	Kotoite Orthorhombic Pnmn	7.0	241000		−18	52,103
174	$SrCuP_2O_7$	925	Monoclinic $P2_1/n$	7.0	101110		−62	104
175	$CaMgSi_2O_6$	900/1h	Monoclinic C2/c	7.0	43200		−22	105
176	$CaMgSi_2O_6$+8.5 wt% ZrO_2	950	Composite	7.0	7300			106
177	Mg_2SiO_4+1 wt% TiO_2 Fosterite	1300	Orthorhombic Pbnm	7.0	230000		−65	107
178	$Ba_2V_2O_7$	950	Anorthic Triclinic P-1	7.0	19000		−74	108
179	δ-$Ba_2P_2O_7$	1150	Dichromatic type Hexagonal P-62m	7.0	12300			47
180	$Ba_2MgSi_2O_7$	1350/10h	Tetragonal P-421m	7.0	31000		−60	109
181	$Sr_2Al_2SiO_7$	1525	Tetragonal $P4\text{-}2_1m$	7.0	33000		−34	110
182	$LiMg_{0.95}Co_{0.05}PO_4$	875/2h	Orthorhombic olivine type	7.0	111200		−54	111
183	$SrZnP_2O_7$	950	Monoclinic $P2_1/n$	7.1	52780		−70	104,112
184	$MgMoO_4$	900	Wolframite Monoclinic C2/m	7.1	79100		−46	113
185	ZnO:B_2O_3:SiO_2 (50:30:20) glass	614Td	Glass	7.1	1670	15.9	−43	92
186	α-$Sr_2P_2O_7$	1150	Dichromatic type Orthorhombic Pnam	7.1	33500		−23	47
187	SrO-B_2O_3-SiO_2 (32.85:52.09:15.05) glass		Glass	7.1	3600	6.7		72
188	$MgTiO_3$+15 wt% $CaTiO_3$+ZnO-B_2O_3-SiO_2(35:25:40)	900/0.5h	Composite	7.1	3500	16	6	114
189	0.95Zn_2SiO_4-0.05$CaTiO_3$+Li_2CO_3-H_3BO_3	950	Trigonal R-3	7.1	26300		−5	115
190	Li_2CaSiO_4+3 wt% ZBS	875	Tetragonal I-42m	7.1	2000			14
191	0.88$(Mg_{0.4}Zn_{0.6})_2SiO_4$–0.12$CaTiO_3$+4 wt% Li_2CO_3–H_3BO_3	950	Composite	7.1	28600		−6	116
192	$Mg_3B_2O_6$		Kotoite Orthorhombic Pnmn	7.2	150400	16		117

193	$BaAl_2Si_2O_8$	1500/12h	Monoclinic	7.2	70600	10.5	−22	118
194	$Sr_{0.05}Ba_{0.95}Al_2Si_2O_8$	1500/40h	Monocelsian Hexagonal P6/mmm	7.2	77000	10.5		118
195	Li_2CaSiO_4+1 wt% LBS	925	Tetragonal I-42m	7.2	4000			14
196	$Sr_2Al_2SiO_7$	1525	Gehlenite Tetragonal P-42_1m	7.2	33000		−37	119
197	CaO-MgO-SiO_2+10 wt% Li_2O-Bi_2O_3 (Sol gel)	890	Composite	7.2	25600		−69	120
198	$Sr_2Al_{1.9}Ga_{0.1}SiO_7$	1525	Tetragonal P-42_1m	7.2	21500		−41	70
199	Mg_2SiO_4+0.5 wt% LMZBS glass Fosterite	1525	Orthorhombic Pbnm	7.3	121200			85
200	Li_2CaSiO_4+3 wt% BZBS	900	Tetragonal I-42m	7.3	1700			14
201	$Sr_2Al_2SiO_7$+0.5 wt% LMZBS glass	1500	Gehlenite P4-2_1m, Tetragonal	7.3	34200		−36	70
202	$Sr_2Al_2SiO_7$+1 wt% LMZBS glass	1500	Gehlenite P4-2_1m, Tetragonal	7.3	36300		−23	70
203	$Sr_{2-x}Ca_xAl_2SiO_7$ (x=0.25)	1450	Tetragonal P4-2_1m	7.3	26000		−34	110
204	$SrZnP_2O_7$	925/2h	Monoclinic $P2_1/n$	7.3	71520		−64	104
205	BaO:B_2O_3:SiO_2 (30:20:50) glass	717 Td	Glass	7.3	1840	14.8	−62	92
206	$BaCu(B_2O_5)$	810		7.3	50000		−32	121
207	CaO-B_2O_3-SiO_2 (69.7:16.2:14.1 mol%)	900	Glass	7.3	2300	9.6		8
208	CaO-B_2O_3-SiO_2 (38.3:31.5:30.2 mol%)	900	Glass	7.3	1800	9.6		8
209	BaO:B_2O_3:SiO_2 (30:40:30) glass	677 Td	Glass	7.3	2700	15.4	−34	92
210	BaO:B_2O_3:SiO_2 (30:60:10) glass	627 Td	Glass	7.3	3390	14.9	−25	92
211	$CaCuP_2O_7$	900/2h	Monoclinic $P2_1/n$	7.3	71620		−76	104
212	$Mn_2P_2O_7$	1150	Monoclinic C2/m	7.3	23850		−96	47
213	$Zn_{1.8}SiO_{3.8}$+12 wt% V_2O_5	875/2h	Trigonal R-3	7.3	17500		−28	122
214	$Y_2BaCu_{0.6}Mg_{0.4}O_5$		Orthorhombic Pmmm	7.4	25320	12.9	−56	58,123
215	$CaAl_2Si_2O_8$ (Anorthite)	1500	Triclinic P-1	7.4	12000		−130	29
216	$MgAl_2O_4$+Li-Mg-Zn-B-Si-O glass	1000	Glass-ceramic	7.4	48000	24	−90	124
217	$Mg_2Si_{0.9}Ti_{0.1}O_4$Fosterite	1425	Orthorhombic Pbnm	7.4	73760	15	−60	125
218	$ZrSiO_4$	1550	Tetragonal $I4_1$	7.4	8500	5.15	−50	126
219	19ZnO-13La_2O_3-68B_2O_3+40 wt% Al_2O_3		Composite	7.4	18100			127
220	xMgO-(1-x)B_2O_3 (x=0.8)	1350/4h	Composite	7.4	247880		−65	93

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
221	$CaMgSi_2O_6$	1300/3h	Monoclinic C2/c	7.4	59700		−42	128
222	$Sr_{2-x}Ca_xAl_2SiO_7$ (x=0.5)	1450	Tetragonal P4-2_1m	7.4	25000		−33	110
223	Alpha $CaSiO_3$+6 wt% SiO_2	1350		7.4	33700		−11	129
224	$Mg_{2.15}SnO_4$	1620/4h	Spinel Cubic Fd3m	7.4	76800		−50	130
225	BaCu (B_2O_5)	850		7.4	23000		−75	131
226	$LiZnVO_4$ (UsingV_2O_5)	800	Trigonal phenakite R-3	7.5	25400		−123	132
227	CaO-B_2O_3-SiO_2 (42:45:13)		Composite	7.5	2400	6.24		72
228	20ZnO-16La_2O_3-64B_2O_3+50 wt% Al_2O_3	950	Composite	7.5	13500		−10	96
229	$BaAl_2Ge_2O_8$	1350/12h	Monoclinic I2/c	7.5	74100		−32	102
230	$SrSiO_3$-NiO	1375	Monoclinic C2	7.5	56500		64	133
231	$HfSiO_4$+2 wt% LMZBS	1400/4h	Tetragonal $I4_1$/amd	7.5	7500	5		134
232	CaO-B_2O_3-SiO_2 (42:45:13) glass		Glass	7.5	2380	6.2		72
233	$DyBO_3$,$HoBO_3$,YBO_3		Vaterite Hexagonal $P6_3$/mmc	7.5	10000			135
234	α-$Zn_2P_2O_7$	1150	Throtveitit Monoclinic C2/m	7.5	50000		−204	47
235	$Mg_{2.05}SiO_4$ Fosterite	1550/3h	Orthorhombic Pbnm	7.5	114700	10.6	−59	75
236	$Ba_2ZnSi_2O_7$	1350	Monoclinic	7.5	48000		−74	109
237	$K_2Mo_2O_7$	460	Triclinic	7.5	22300		−63	33
238	ZnO:B_2O_3:SiO_2 (60:20:20) glass	<800	Glass	7.5	1410	15.4	−84	92
239	ZnO:B_2O_3 (60:40) glass	<800	Glass	7.5	1430	15.1	−3	92
240	$LiZnVO_4$ (Using NH_3VO_3)	720	Trigonal phenakite R-3	7.5	27600		−114	132
241	ZnO:B_2O_3:SiO_2 (60:30:10) glass	<800	Glass	7.6	1440	15.5	−21	92
242	$CaZnP_2O_7$	900/2h	Pyrophosphate	7.6	63130		−82	136
243	20CaO-20La_2O_3-60B_2O_3+40 wt% Al_2O_3	850	Composite	7.6	5000	17.4		137
244	BaO-B_2O_3-SiO_2 (42:45:13) glass		Glass	7.6	4100	6.65		72
245	$BaGa_2Si_2O_8$	1350/12h	Monoclinic I2/c	7.6	62300		−32	102
246	24ZnO-16La_2O_3-60B_2O_3+50 wt% Al_2O_3	950	Glass	7.6	17600	16.9	−14	96
247	$CaMgSi_2O_6$	1300 CIP	Monoclinic C12/c1	7.6	121380		−66	138

248	Zn_2SiO_4+8 mol% Bi_2O_3	885/2h	Trigonal R-3	7.6	12600		−22	139
249	BaO-B_2O_3-SiO_2 (42:45:13)		Glass	7.6	4000	6.65		72
250	$LiZnVO_4$	750/2h	Rhombohedral R3	7.6	22000		−110	140
251	xMgO-(1-x)B_2O_3 (x=0.9)	1350/4h	Orthorhombic Pnmn	7.7	376800		−58	93
252	$Y_2BaCu_{0.9}Mg_{0.1}O_{5\ CIP}$	1250	Orthorhombic Pbnm	7.7	37500	14.5	−37	123
253	$CaMg_{0.9}Zn_{0.1}Si_2O_6$+0.6 wt% LiF	900	Monoclinic C12/c1	7.7	70000		−25	141
254	0.91Mg_2SiO_4-0.09$CaTiO_3$+12 wt% Bi_2O_3-Li_2CO_3-H_3BO_3	950	Fosterite composite	7.7	11300	6.1	−5	142
255	$Li_2Mg_2(WO_4)_3$	875	Orthorhombic Pnma	7.7	29600	6	−16	143
256	α-$Ca_2P_2O_7$	1290/4h	Monoclinic $P2_1/n$	7.8	14100		−97	144
257	Li_2CaSiO_4+3 wt% PBS	900	Tetragonal I-42m	7.8	2700			14
258	$Mg_3Sm_4Al_{44}O_{75}$+B_2O_3-SiO_2-Al_2O_3	920	Mgnetoplumbite	7.8	10000		11	145
259	$DyPO_4$	1600	Xenotime tetragonal $I4_1/amd$	7.8	28700		−17	146
260	$TbPO_4$	1600	Xenotime tetragonal $I4_1/amd$	7.8	20100		−18	146
261	27ZnO-16La_2O_3-57B_2O_3+50 wt% Al_2O_3	950	Composite	7.8	22700	16.8	−19	96
262	45CaO-31.7B_2O_3-23.3SiO_2	715	Composite	7.8	1130	12.5		6
263	27ZnO-16La_2O_3-57B_2O_3 glass+50 wt% Al_2O_3		Composite	7.8	1350	16.8		96
264	xMgO-(1-x)B_2O_3 (x=0.85)	1350/4h	Composite	7.8	307600		−58	93
265	$Li_xZn_{2-x}V_xSi_{1-x}O_4$ (x=0.8)	820		7.8	21100	11.5		147
266	$CaMg_{0.9}Zn_{0.1}Si_2O_6$+5 wt% MgF_2	1050		7.8	169800	11.7	−26	148
267	Yb_2BaCuO_5		Orthorhombic Pnma	7.9	7290		−44	149
268	$LiMgPO_4$+0.05 vfTiO_2	950	Orthorhombic Pmnb	7.9	63600		−36	67
269	$SrWO_4$	1150	Tetragonal $I4_1/a$	7.9	56000		−55	150
270	$Mg_3(VO_4)_2$	950/10h	Orthorhombic Cmca	7.9	53000		−84	57
271	CaO-B_2O_3-SiO_2(50.1:22.2:67.3 mol%)	900	Composite	7.9	2100	9.6		8
272	$CaMg_{0.9}Zn_{0.1}Si_2O_6$	1200	Monoclinic C2/c	7.9	76100		−22	141
273	$ZnAl_2O_4$	1700	Spinel cubic Fd3m	7.9	82000		−63	151
274	$Sr_2ZnSi_2O_7$+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	ε_r	Qf (GHz)	f_0	τ_f	Reference
276	Nd_2SiO_5	1500	Monoclinic $P2_1/c$	7.9	38800	18.35	−53	154
277	$Ca(Sn_{0.1}Si_{0.9})O_3$	1375	Monoclinic $P2_1/a$	7.9	58000		−43	155
278	α-$CaSiO_3$+2 wt% TiO_2	1300	Mixture	7.9	16500		1	156
279	$Ca(Mg_{1-x}Al_x)(Si_{1-x/2}Al_{x/2})_2O_6$ (x=0.08)	1275	Monoclinic C2/c	7.9	59800		−42	157
280	$NaAgMoO_4$	400	Spinel Fd-3m	7.9	33000		−120	158
281	Mg_2SnO_4+LiF-Fe_2O_3-V_2O_5	1050	Cubic Fd3m	7.9	41400		−82	159
282	α-$CaSiO_3$+2 wt% Al_2O_3+2.5 wt% TiO_2	1250	Composite	7.9	24000		−1	160
283	5ZnO-2B_2O_3+6 mol% $Pb_{1.5}Nb_2O_{6.5}$	910	Composite	7.9	15000	7.4	−7	161
284	CAS-T5 glass (CaO:Al_2O_3:SiO_2:TiO_2:B_2O_3)	950	Composite	8.0	22500	10	−20	163
285	$CaMgSi_2O_6$+15 wt% LBS glass	925/2h	Monoclinic C2/c	8.0	15000	10.17	−49	164
286	$Ca_{1-x}Cd_xMoO_4$ (x=0)	1075	Sheelite fergusonite type Tetragonal $I4_1/a$	8.0	46500		−20	165
287	$CaAl_2Si_2O_8$+5 wt% TiO_2	900	Anorthic I-1	8.0	22500		−50	163
288	$CaMgSi_2O_6$+12 wt% Al_2O_3	1250	Composite	8.0	60100		−48	166
289	Li_2O-B_2O_3-SiO_2-Al_2O_3-CaO	550	Composite	8.0	2400		−48	167,168
290	La_2O_3-2B_2O_3-0.5ZnO	900	Composite	8.0	72000	13		169
291	YPO_4	1600	Xenotime tetragonal $I4_1/amd$	8.0	67900		−35	146
292	$Sr_{2-x}Ca_xAl_2SiO_7$ (x=1)	1475	Tetragonal P4-2_1m	8.0	27500		−42	110
293	0.94Mg_2SiO_4-0.06$Ca_{0.9}Sr_{0.1}TiO_3$	1440/3h	Composite	8.0	53400	14.4	−4	170
294	20MgO-20La_2O_3-60B_2O_3+40 wt% Al_2O_3	950	Composite	8.1	19000			137
295	$BaWO_4$	1150	Scheelite Tetragonal $I4_1/a$	8.1	56000		−55	150,171
296	$SrWO_4$	1150	Tetragonal $I4_1/a$	8.1	57500		−78	150
297	$MgZn_2(VO_4)_2$	800/5h	Orthorhombic Cmca	8.1	44700		−108	172
298	Li_2CaSiO_4+3 wt% BBS	900	Tetragonal I-42m	8.1	2000			14
299	60 wt% La_2O_3-B_2O_3+40 wt% Al_2O_3	850	Composite	8.1	4500	17.5		78
300	$CaZrB_2O_6$	1075	Dolomite type borate	8.1	39400		3	173
301	$Mg_{0.8}Zn_{0.2}Al_2O_4$		Spinel Cubic Fd3m	8.1	87000			174

302	$20MgO\text{-}20La_2O_3\text{-}60B_2O_3$+40 wt% Al_2O_3	950	Composite	8.1	19000	16.1		137
303	$(Mg_{0.95}Zn_{0.05})Al_2O_4$	1580	Spinel cubic Fd3m	8.1	165000		−68	175
304	Ag_2MoO_4	450 2h	Cubic Fd3-m	8.1	17000		−133	176
305	$MgTiO_3\text{-}CaTiO_3$ (MMT-20)+ $SiO_2\text{-}B_2O_3\text{-}BaO$	875	Composite	8.2	3000	7		177
306	$BaWO_4$+0.5 wt% B_2O_3	950	Scheelite Tetragonal $I4_1/a$	8.2	32700		−18	48,49
307	$20ZnO\text{-}20La_2O_3\text{-}60B_2O_3$+40 wt% Al_2O_3	950	Composite	8.2	20000	17.1		137
308	$CaMgSi_2O_6$+15 wt% LMZBS glass	900/2h	Monoclinic C2/c	8.2	32000	10.15	−48	164
309	$Mg_{0.6}Zn_{0.4}Al_2O_4$		Spinel Cubic Fd3m	8.2	93000			174
310	$LiMg_{0.9}Zn_{0.1}PO_4$+0.05 Vf TiO_2	925	Orthorhombic Pmnb Olivine type	8.2	80200		−39	82
311	$Nd_2Mo_3O_{12}$	945	Monoclinic C2/c	8.2	80000		−60	178
312	$Mg_2V_2O_7$+6 mol %Li_2CO_3	800	Monoclinic $P2_1/c$	8.2	70600		−35	179
313	$LiInSiO_4$	1150	Orthorhombic Pnma	8.2	12600		−55	180
314	$Zn_2(Sn_{1-x}Si_x)O_4$ (x=0.07)	1175/4h		8.2	55500		−120	181
315	$BaMgV_2O_7$	830	Orthorhombic	8.2	37600	11.7	−35	182
316	$YbPO_4$	1600	Xenotime tetragonal $I4_1/amd$	8.2	71600		−28	146
317	70 wt% $La_2O_3\text{-}B_2O_3$+30 wt% Al_2O_3	850	Composite	8.3	5500	17.2		78
318	Li_2CaSiO_4+1 wt% BBS	925	Tetragonal I-42m	8.3	10000			14
319	Y_2BaCuO_5 (CIP)		Orthorhombic Pbnm	8.3	53300		−40	123
320	$20ZnO\text{-}20La_2O_3\text{-}60B_2O_3$+40 wt% Al_2O_3	950	Composite	8.3	18600	17		137
321	$Mg_{0.75}Ni_{0.25}Al_2O_4$		Spinel cubic Fd3m	8.3	130000	15.4	−53	183
322	$CaMgSi_2O_6$	1300/2h	Monoclinic C2/c	8.3	53000	10.27	−45	164
323	$Mg_{0.4}Zn_{0.6}Al_2O_4$		Spinel cubic Fd3m	8.3	93000			174
324	$Sr_2MgSi_2O_7$	1550	Akermite Tetragonal $P4\text{-}2_1m$	8.3	55000		−48	133
325	$20ZnO\text{-}20La_2O_3\text{-}60B_2O_3$+40 wt% Al_2O_3	850	Composite	8.3	1100	17.1		137
326	$LiInSiO_4$+1 wt% LMZBS	1100	Orthorhombic Pnma	8.4	22000		−45	180

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
327	$Ca_3SnSi_2O_9$	1525	Cuspidine $P2_1/c$	8.4	92000		−60	184
328	$Mg_{0.2}Zn_{0.8}Al_2O_4$		Spinel cubic Fd3m	8.4	98000			174
329	Sm_2SiO_5	1500	Monoclinic $P2_1/c$	8.4	64000		−37	185
330	Mg_2SnO_4	1550/4h	Cubic spinel Fd3m	8.4	55100		−62	186
331	$MgAl_2O_4$ (SPS)	1325	Spinel cubic Fd3m	8.4	54000		−74	187
332	(1-x)$Ba_3(VO_4)_2$-xMg_2SiO_4 (x=0.65)	1200	Composite	8.4	52200		−7	188
333	80 wt% La_2O_3-B_2O_3+20 wt% Al_2O_3	850	Composite	8.4	9800	17.6		78
334	$CaSiO_3$	1300	Wollastonite Monoclinic $P2_1/a$	8.4	16000	10		189
335	$Ca_3SnSi_2O_9$	1400	Monoclinic $P2_1/c$	8.4	93300		−70	189
336	$Sr_2ZnSi_2O_7$	1475	Akermite Tetragonal P4-2_1m	8.4	105000		−52	133
337	β-$Ca_2P_2O_7$	1150/2h	Tetragonal $P4_1$ dichromatic type	8.4	53500		−53	104
338	$Ca_2Al_2SiO_7$	1500	Tetragonal P4-2_1m	8.4	33000		−34	110
339	0.86$(Mg_{0.4}Zn_{0.6})_2SiO_4-0.14CaTiO_3$	1180/4h	Composite	8.4	28100		−6	190
340	$Li_2Mg_2W_3O_{12}$	720	Lyonsite-type orthorhombic	8.4	56700		−73	191
341	$BaZnP_2O_7$	875/2h	Triclinic P-1	8.4	27900	11.1	−57	192
342	$Li_2Mg_2W_3O_{12}$	720	Orthorhombic lyonsite	8.4	56700		−73	193
343	$Yb_2Ba(Cu_{0.5}Ni_{0.5})O_5$			8.5	13300		−46	194
344	$TbPO_4$	1650/2h	Tetragonal $I4_1/amd$	8.5	20100		−17	146
345	$MgAl_2O_4$	1650/3h	Spinel Cubic Fd3m	8.5	105000		−63	195
346	Li_2MgSiO_4		Orthorhombic	8.5	30000	15		117
347	Li_2O-B_2O_3-SiO_2 frit glass	<800	Glass	8.5	1800		−157	196
348	$MgTiO_3$-$CaTiO_3$ (MMT)-20-ZnO-B_2O_3-SiO_2 (44.57:17.32:6.95:30.16)	875	Composite	8.5	7000	7	6	177,197
349	$ZnAl_2O_4$	1375	Spinel Cubic Fd3m	8.5	56000	12.3	−79	198
350	ZnO-B_2O_3-SiO_2-MMT-20 (44.57:17.32:6.95:30.16)	875	Composite	8.5	3000	7	6	197
351	$Mg_4Nb_2O_9$ (Precipitation)	950	Corundum type P-3c1	8.5	50000			199
352	$CaMgSi_2O_6$+1 wt% LBS glass	1300/2h	Monoclinic C2/c	8.5	64000	10.27	−45	164
353	0.84Al_2O_3-0.16TiO_2+8 wt% MCAS glass	1250	Composite	8.5	9900		−2	200
354	$MnMoO_4$	900	Wolframite Monoclinic C2/m	8.5	54100		−74	113

355	Mn_2SiO_4	1100/N_2	Orthorhombic Pbnm	8.5	50000		−90	79,201
356	$Ca_{0.8}Sr_{0.2}SnO_3$	1540	Perovskite Orthorhombic Pbnm	8.5	6700		−44	202
357	13CaO-19La_2O_3-68B_2O_3+40 wt% Al_2O_3		Composite	8.5	8100			127
358	$(Zn_{0.8}Mg_{0.2})_2SiO_4$-$TiO_2$+3 wt% Li_2O-B_2O_3-SiO_2 glass	870/2h	Composite	8.5	11500		0	203
359	$(Mg_{0.93}Zn_{0.07})_2SnO_4$	1550/4h	Cubic spinel Fd3m	8.5	186100		−61	204
360	$Mg_{0.8}Co_{0.2}Al_2O_4$	1475	Spinel cubic Fd3m	8.5	50000		−60	205
361	$CaW_{1-x}Te_xO_4$ (x=0.15)	900	Scheelite $I4_1/a$	8.5	44000			206
362	$Sr_2ZnSi_2O_7$	1475	P-42_1/m Hardystonite	8.5	105000		−52	133,152
363	$Li_2Ca_2Mo_3O_{12}$	630	Lyonsite orthorhombic	8.5	108000	13.2	−89	207
364	$Y_2BaCu_{0.25}Ni_{0.75}O_5$		Orthorhombic Immm	8.6	31290	12.5	−36	58
365	0.88Al_2O_3-0.12TiO_2+2 wt% MCAS glass	1250	Composite	8.6	9580		5	208
366	$(Mg_{1/2}Zn_{1/2})Al_2O_4$	1600/4h	Spinel Cubic Fd3m	8.6	95000		−52	209
367	Ca_2SiO_4	1450	Orthorhombic $P2_1/n$	8.6	26100		−89	210
368	$SrW_{1-x}Te_xO_4$ (x=0.2)	800	Scheelite Tetragonal $I4_1/a$	8.6	38400			206
369	$SrW_{1-x}Te_xO_4$ (x=0.0)	900	Scheelite Tetragonal $I4_1/a$	8.6	37900		−57	206
370	0.96$Sr_2Al_2SiO_7$-0.04$CaTiO_3$	1500	Tetragonal P-42_1m	8.6	20400		9	119
371	$LiSrBO_3$	800	Monoclinic $P2_1/c$	8.6	60000		−39	211
372	Li_4WO_5	890	Orthorhombic rocksalt	8.6	23100	11	−3	212
373	$LiCaBO_3$	800	Orthorhombic Pbca	8.7	75000		−150	211
374	$ZnMoO_4$	800	Wolframite Triclinic P-1	8.7	49900		−87	113
375	$CaWO_4$+0.5 wt% Bi_2O_3+9 wt% H_3BO_3	850	Scheelite Tetragonal $I4_1/a$	8.7	70220		−15	213
376	$CaWO_4$	1200	Scheelite Tetragonal $I4_1/a$	8.7	75000		−54	150
377	$(Al_{1/2}Ta_{1/2})O_2$	1600	Tetragonal P4/nmm	8.7	60800		−55	214
378	Ca-Al-B-Si-O+Al_2O_3 (K8)	870	Composite	8.7	900	3	–	215
379	$NdPO_4$	1300	Monoclinic $P2_1/n$	8.7	59500		−47	146
380	$(Mg_{0.95}Ni_{0.005})_2SnO_4$	1550/4h	Cubic Spinel Fd3m	8.7	103100		−63	216
381	$ZnAl_2O_4$SPS		Spinel Cubic Fd3m	8.7	57000			151
382	$SrW_{1-x}Te_xO_4$ (x=0.1)	800	Scheelite $I4_1/a$	8.7	40300			206
383	$(Mg_{1/2}Co_{1/2})Al_2O_4$	1600	Spinel Cubic Fd3m	8.8	107300		−54	217

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
384	$Sr_2MnSi_2O_7$	1375	Akermite Tetragonal P4-2_1m	8.8	32000		−59	133
385	$Ca_{0.5}Sr_{0.5}Zr_4P_6O_{24}$	1400	Trigonal R-3	8.8	1200	11	−32	218
386	$Li_2Mo_4O_{13}$	520	Anorthic P-1	8.8	7700	10.7	−66	30
387	xMgO-(1-x)B_2O_3 (x=0.95)	1350/4h	Orthorhombic Pnmn	8.8	432000		−55	93
388	BaO-ZnO-SiO_2	1275	Composite	8.8	34000		−58	133
389	$Sr_2ZnSi_2O_7$+2 wt% $SrTiO_3$	1450	Akermite Tetragonal P4-2_1m	8.8	60000		−13	133
390	0.4$Ba_3(VO_4)_2$-0.6Mg_2SiO_4	1200	Composite	8.8	55900		−1	188
391	$(Zn_{0.8}Mg_{0.2})_2SiO_4$-$TiO_2$+3 wt% Li_2O-B_2O_3	900	Mixed phases	8.8	15500		18	219
392	CaO-Al_2O_3-SiO_2-B_2O_3+Al_2O_3	900	Composite	8.8	1500			220
393	Zn_2SnO_4+0.5 wt% $BaCuB_2O_5$	1150/4h	Spinel Fd-3m	8.8	30900		−88	221
394	$Li_2Mg_3SnO_6$	1360	Cubic rocksalt Fm-3m	8.8	123000	10.7	−32	222
395	$Sr_2CoSi_2O_7$	1375	Akermite Tetragonal P4-2_1m	8.9	34000		−57	133
396	ZnO-B_2O_3-SiO_2-MMT-20 (46.34:17.09:6.85:29.72)	900	Composite	8.9	7000	8	−24	197
397	$CaGeO_3$	1200	Orthorhombic Pbnm	8.9	32200	10		223
398	ZnO-B_2O_3-SiO_2-MMT-20(44.97:17.2:6.9:29.93)	900	Composite	8.9	810	8	−15	177,197
399	ZnO-B_2O_3-SiO_2-MMT-20(46.34:17.09:6.85:29.72)	900	Composite	8.9	800	8	−24	177,197
400	$ZnTiO_3$+1 wt% B_2O_3	900/4h	Trigonl R-3	8.9	49000		−32	224
401	$CaSiO_3$+1 wt% Al_2O_3+1.5 wt% Li_2CO_3+0.2 wt% CuO+10 wt% $CaTiO_3$	900	Composite	8.9	19800		−1	225
402	$Mg(Al_{1-x}Ga_x)_2O_4$ (x=0.6)	1485	Cubic Fd3m	8.9	107000	14.8	−16	226
403	$LiMgVO_4$	700/4h	Orthorhombic	8.9	23300	10.2	−140	227
404	xMgO-(1-x)B_2O_3 (x=0.97)	1350/4h	Orthorhombic Pnmn	9.0	547700		−55	93
405	$Ca_{1-x}Cd_xMoO_4$ (x=0.2)		Scheelite Tetragonal I4$_1$/a	9.0	32500		−40	165
406	$BaWO_4$		Scheelite Tetragonal I4$_1$/a	9.0	32200			228
407	$BaMoO_4$	900	Scheelite Tetragonal I4$_1$/a	9.0	37100		−90	229

408	$SrWO_4$		Scheelite Tetragonal $I4_1/a$	9.0	62600			228
409	$(1-x)Ba_3(VO_4)_2$-xMg_2SiO_4 (x=0.55)	1175	Composite	9.0	52500		0	188
410	ZnO-B_2O_3-SiO_2-MMT-20(49.21:16.15:6.49:28.15)	900	Composite	9.0	7000	8	−62	197
411	Co_3O_4-Nb_2O_5-TiO_2	1010	Mixture	9.0	41000	7.5	−59	230
412	$MgTiO_3$-$CaTiO_3$-ZnO-B_2O_3-SiO_2		Composite	9.0	7000	7	−55	197
413	PbO:B_2O_3:SiO_2 (30:60:10) glass		Glass	9.0	1700	13.5	−15	92
414	$5ZnO$-Ta_2O_5-TiO_2	1150	Composite	9.0	9000	7.9	−45	230
415	$0.9CaWO_4$-$0.1Li_2WO_4$	1150	Composite	9.0	117600		−55	231
416	Yb_2BaNiO_5		Orthorhombic Pnma	9.1	44600		−37	149
417	K_2O-B_2O_3-SiO_2-CaO-SrO-BaO (glass)+Al_2O_3	900	Composite	9.1	600	0.5	0	232
418	Yb_2BaZnO_5		Orthorhombic Pnma	9.1	44600		−38	149
419	$DyPO_4$	1650/2h	Tetragonal $I4_1/amd$	9.1	28600		−17	146
420	α-$Ca_3(PO_4)_2$	1500/10min	Monoclinic $P2_1/a$	9.1	22000		−97	233
421	$xMgO$-$(1-x)B_2O_3$ (x=0.96)	1350/4h	Orthorhombic Pnmn	9.1	473890		−57	93
422	$CaSnSiO_5$	1525	Monoclinic A2/a	9.1	61000		35	234
423	$Mg_3(VO_4)_2$	950/50h	Orthorhombic Cmca	9.1	64100	–	−93	57
424	Zn_2SiO_4+11 wt% TiO_2	1200	Composite	9.1	150800		−1	69
425	$0.89Zn_2SiO_4$-$0.11TiO_2$		Composite	9.1	118000		1	235
426	$Ba_3(PO_4)_2$-$0.2BaWO_4$+0.8 wt% B_2O_3	925	Composite	9.1	45500		−2	236
427	$LiMgVO_4$	675/2h	Orthorhombic Cmcm	9.1	33700		−160	140
428	$0.95Sr_2Al_2SiO_7$-$0.05CaTiO_3$	1475	Gehlenite Tetragonal $P\text{-}42_1m$	9.2	14400		24	119
429	$BaMoO_4$	800	Scheelite Tetragonal $I4_1/a$	9.2	26600		−17	49
430	CaO-MgO-SiO_2-TiO_2+1 wt% Li_2CO_3-V_2O_5	880	Composite	9.2	46200		1.3	128
431	$xMgO$-$(1-x)B_2O_3$ (x=0.98)	1350/4h	Orthorhombic Pnmn	9.2	598370		−54	93
432	$Ca_{1-x}Cd_xMoO_4$ (x=0.4)	1025	Scheelite Tetragonal $I4_1/a$	9.2	38500		−40	165
433	BaO:B_2O_3:SiO_2 (50:40:10) glass	<800	Glass	9.2	1220	13.1	−43	92
434	$Ca_5Mg_4(VO_4)_6$	800	Cubic garnet Ia-3d	9.2	53300	10.6	−50	237
435	$Y_2BaCu_{0.9}Mg_{0.1}O_5$	1250	Orthorhombic Pbnm	9.2	36798		−36	123

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
436	(1-x)$LiYW_2O_8$-x$BaWO_4$+y wt% B_2O_3 (x=0.48, y=0.5)	930	Mixed phases	9.2	28100		−52	48
437	0.88$CaMgSi_2O_5$-0.12$CaTiO_3$+1 wt% Li_2CO_3-V_2O_5	880/2h	Composite	9.2	46200		1	128
438	1.8MgO-1.2Al_2O_2-2.8SiO_2-1.2TiO_2-0.4La_2O_3	1200	Composite	9.2	28600		−99	238
439	$SmBO_3$		Vaterite Hexagonal $P6_3/mmc$	9.3	11000			135
440	$LiMgPO_4$+0.1 vfTiO_2	950	Orthorhombic Pmnb	9.3	45400		−12	67
441	0.84$MgAl_2O_4$-0.16TiO_2	1410	Composite	9.3	82200	10.1	−27	187
442	$BaMoO_4$	900	Scheelite Tetragonal I41/a	9.3	37200		−79	113
443	Zn_2SiO_4+11 wt% TiO_2	1250	Composite	9.3	113000		1	73
444	xMgO-(1-x)B_2O_3 (x=0.993)	1350/4h	Orthorhombic Pnmn	9.3	773700		−55	93
445	xMgO-(1-x)B_2O_3 (x=0.995)	1350/4h	Orthorhombic Pnmn	9.3	551700		−56	93
446	xMgO-(1-x)B_2O_3 (x=0.999)	1350/4h	Cubic Fm3m	9.3	380400		−56	93
447	$Ca(Sn_{0.4}Si_{0.6})O_3$	1450	Monoclinic $P2_1/a$	9.3	63000		−52	155
448	0.8$ZnAl_2O_4$-0.2Co_2TiO_4		Spinal Cubic Fd3m	9.3	147000		−65	239
449	$Ba_3(VO_4)_2$+40 wt% $Zn_{1.87}SiO_{3.87}$	1100	Composite	9.3	23000		0	240
450	Zn_2SnO_4+1 wt% B_2O_3	975	Cubic Fd3m	9.3	62000		−59	241
451	Al_2O_3+20 wt% $CaSiO_3$	1325	Composite	9.4	13700			242
452	$Ba_3MgSb_2O_9$		Complex perovskite Hexagonal $P6_3/mmc$	9.4	6700	8.98		243
453	0.84Al_2O_3-0.16TiO_2+4 wt% MCAS glass	1250	Composite	9.4	8200		10	200
454	Y_2BaCuO_5		Orthorhombic Pbnm	9.4	3830	12	−35	244
455	α-$Ca_3(PO_4)_2$ Fluoro apatite	1500/8h	Trigonal R-3m	9.4	15200		−97	233
456	0.88$CaMgSi_2O_5$-0.12$CaTiO_3$	1300/2h	Composite	9.4	50800		6	128
457	$Mg_3(VO_4)_2$	1050	Orthorhombic Cmca	9.4	65500		−90	57
458	$MgCo_2(VO_4)_2$	900/5h	Orthorhombic Cmca	9.4	78900		−95	245
459	$SrMoO_4$	1050	Scheelite Tetragonal $I4_1/a$	9.5	61000		−67	113
460	La_2O_3-2B_2O_3-0.5ZnO+La_2O_3-3B_2O_3-0.5ZnO	900	Glass	9-10	72000	13		169

461	$BaO:B_2O_3:SiO_2$ (50:30:20) glass		Glass	9.5	1256	13.5	−95	92
462	$Y_2BaCu_{0.8}Mg_{.0.2}O_5$		Orthorhombic Pbnm	9.5	42300	−38		123
463	(1-x)$Ba_3(VO_4)_2$-xMg_2SiO_4 (x=0.5)	1175	Composite	9.5	46600		6	188
464	$Li_3AlMo_3O_{12}$	570	Lyonsite Psudohexagonal	9.5	50000	14.1	−73	207
465	$Ca_{1-x}Cd_xMoO_4$ (x=0.6)	1000	Scheelite Tetragonal $I4_1/a$	9.5	35700		−48	165
466	Sr_2SiO_4	1575	Monoclinic $P2_1/n$	9.5	19100		−205	210
467	$CaMoO_4$-xY_2O_3-xLi_2O (x=0.306)	775	Composite	9.5	63200		7	246
468	$MgGa_2O_4$	1410	Spinel Fd3m	9.5	117000	14.7	−4	247
469	$LiMgVO_4$	700	Orthorhombic Cmcm	9.5	34800		−146	248
470	$LiMg_{0.9}Zn_{0.1}PO_4$+0.1 Vf TiO_2	950	Orthorhombic Pmnb Olivine type	9.5	69500		−15	82
471	$CaWO_4$+0.12 wt% $BaCu(B_2O_5)$	875		9.5			−41	249
472	0.75Li_2ZnSiO_4-0.25$CaTiO_3$+25 wt% ZnO-B_2O_3	950	Composite	9.5	11800	7.8	−5	250
473	0.79$ZnAl_2O_4$-0.21 Mg_2TiO_4	1550	Composite	9.6	160800		−65	251
474	0.79$ZnAl_2O_4$-0.21Mn_2TiO_4	1300 SPS	Composite	9.6	30630		–	151
475	0.96 MgO-0.04LiF	950	Cubic Fm3m	9.6	282230		−63	252
476	$Ba_3CaSb_2O_9$		Complex perovskite Monoclinic C2/c	9.6	3400	9.2		243
477	$SrDy_4Si_3O_{13}$	1475/4h	Hexagonal apatite $P6_3/m$	9.6	9200		28	253
478	$BaO:B_2O_3:SiO_2$ (50:20:30) glass		Glass	9.6	1310	14.3	−114	92
479	$Ba_3V_4O_{13}$	6001h	Monoclinc I2/a	9.6	56000		−42	254
480	$Ba_2V_2O_7$	840/1h	Triclinic	9.6	30300		−32	255
481	$Zn_2(Sn_{0.99}Zr_{0.01})O_4$	1225/4h	Cubic Fd-3m	9.6	87000		−51	256
482	RE mixPO_4	1250	Monoclinic $P2_1/n$	9.6	45200	13.5	−35	257
483	$Ca(Mg_{0.92}Al_{0.08})(Si_{0.96}Al_{0.04})_2O_6$+10 wt% $CaTiO_3$	1250	Mixture	9.6	32600		−1	258
484	ZnO-B_2O_3-SiO_2-MMT-20(44.77:17.59:7.05:30.59)	900	Composite	9.7	7000	8	9	197
485	$CrTaO_4$		Rutile type Tetragonal $P4_2/mnm$	9.7	1600	4		53
486	$Y_2BaCu_{0.6}Ni_{0.4}O_5$	1270/3h	Orthorhombic Pnma	9.7	36000		−27	259

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
487	β-$Ca_3(PO_4)_2$	1125/8h	Rhombohedral R3C	9.7	10300		−47	233
488	0.79$ZnAl_2O_4$-0.21 Mn_2TiO_4	1400	Composite	9.7	23500		−63	251
489	$(K_{0.5}Sm_{0.5})MoO_4$	800/2h	Monoclinic I2/b	9.7	20000		−65	260
490	Al_2O_3+1500 ppm MgO+300 ppm La_2O_3			9.7	300000			261
491	0.55$Ba_3(VO_4)_2$-0.45$LiMgPO_4$	850	Composite	9.7	50700		1	262
492	0.8$LiZnVO_4$-0.2TiO_2	640	Composite	9.7	39200		−20	140
493	$Li_3InMo_3O_{12}$	630	Lyonsite Orthorhombic Pcn	9.8	36000	15	−73	207
494	$CaSiO_3$+1 wt% Al_2O_3+10 wt% $CaTiO_3$+1 wt% Li_2CO_3-CuO	900	Composite	9.8	19800		−1	263
495	$LiMgVO_4$ (UsingV_2O_5)	810	Orthorhombic Cmcm	9.8	26500		−166	132
496	$LiMgVO_4$ (Using NH_3VO_3)	720	Orthorhombic Cmcm	9.9	30800		−171	132
497	$Y_2BaCu_{0.8}Mg_{.0.2}O_{5\ CIP}$	1250	Orthorhombic Pbnm	9.9	49200	12.8	−40	123
498	$(K_{0.5}Nd_{0.5})MoO_4$	760/2h	Monoclinic I2/b	9.9	69000		−62	260
499	$(Mg_{1/2}Ca_{1/2})WO_4$+1 wt% Li_2WO_4	950	Wolframite P2/c	9.9	30150		−63	48
500	$MgWO_4$	950	Wolframite Monoclinic P2/c	9.9	5400			264
501	0.79$ZnAl_2O_4$-0.21 Co_2TiO_4	1500	Spinel cubic Fd3m	9.9	94000		−66	251
502	$Ca_{1-x}Cd_xMoO_4$ (x=0.8)	925	Sheelite Tetragonal I41/a	9.9	34000		−50	165
503	$CaW_{1-x}Te_xO_4$ (x=0.05)	900	Scheelite Tetragonal $I4_1/a$	9.9	53600			206
504	$Sr_2V_2O_7$+1 mol% Li_2CO_3	800	Anorthic P-1	9.9	73800		−29	265
505	0.96$CaWO_4$-0.04$Na_2W_2O_7$	875	Wolframite Monoclinic P2/c	9.9	64400			266
506	$Nd_4Si_3O_{12}$	1450	Hexagonal $P6_3/m$	9.9	6300	11.7	−12	154
507	$Zn_2(Sn_{0.95}Ti_{0.05})O_4$	1225/4h		9.9	76900		−38	267
508	$Li(Mg_{1-x}Ni_x)PO_4$ (x=0.05)	875	Orthohombic	9.9	50800		−1	99
509	$LiMg_{0.95}Ni_{0.05}PO_4$+11 wt% TiO_2	875	Orthorhombic olivine type	9.9	50800		−1	99
510	$Na_6Mo_{11}O_{36}$	510	Anorthic P-1	9.9	57000		−68	11
511	$BiCaVO_6$	900	$Cmc2_1$	9.9	23600		−71	540
512	$CaWO_4$	1290	Wolframite Monoclinic P2/c	10.0	50800		−50	264,266
513	$LiMgPO_4$+0.12TiO_2	950	Composite	10.0	26900		1	67
514	$Ba_3Nb_2P_4O_{18}$	1150	P-1	10.0	58400		−34	268

515	$0.83ZnAl_2O_4$-$0.17TiO_2$+10 wt% BBSZ glass	950	Composite	10.0	10000		−23	269
516	Al_2O_3	1400/8h	Trigonal R-3c	10.0	634000	14	−40	270
517	$CaW_{1-x}Te_xO_4$ (x=0.15)	850	Scheelite Tetragonal $I4_1/a$	10.0	42000		−61	206
518	$0.5Ba_3(VO_4)$-$0.5Zn_{1.87}SiO_{3.87}$+3 wt% B_2O_3		Composite	10.0	40800		0.5	271
519	TiO_2-$CaAlSi_2O_8$	960/0.5h	Composite	10.0	22500		−10	163
520	$Y_2Ba(Cu_{0.8}Mg_{0.2})O_5$ (CIP)			10.0	49180		−40	123
521	CAS-T10 glass ($CaO:Al_2O_3:SiO_2:TiO_2:B_2O_3$)	950	Composite	10.0	22500	10	−15	163
522	Al_2O_3+0.5 wt% TiO_2	1550/5h	Composite	10.0	453000	9		272
523	Al_2O_3	1550/5h	Trigonal R-3c	10.0	335000		−60	272
524	CaO-4ZnO-Ta_2O_5-TiO_2	1225	Mixture	10.0	15000	8.4	−60	230
525	$Mg_4Nb_2O_9$+3 wt% LiF	950/10H	Corundum type Hexagonal P-3c1	10.0	116420		−72	273
526	$LiMgPO_4$+0.12 vfTiO_2	950	Orthorhombic Pmnb	10.0	26900		−1	67
527	$Mg_4Ta_2O_9$	1450	Corundum trigonal P-3c1	10.0	345000		−70	274
528	Al_2O_3+500 ppm TiO_2		Hexagonal R-3c	10.0	500000	10		275
529	Mg_4NbSbO_9	1450/10h	Corundum type P-3c1	10.0	280000		−70	276
530	$BaTeO_3$	800	Orthorhombic Pnma	10.0	34000		−54	277
531	$Sm_2Si_2O_7$	1375	Tetragonal $P4_1$	10.0	2000	10		97
532	Al_2O_3+0.015 vf TiO_2		Composite	10.0	300000	10	0	278
533	$CaWO_4$	1150	Scheelite Tetragonal $I4_1/a$	10.0	75000		−24	150,279
534	$NaCa_2Mg_2V_3O_{12}$	915/4h	Cubic garnet Ia3d	10.0	50600		−47	280
535	45Vol% $LiMg_{0.9}Zn_{0.}1PO_4$+$Ba_3(VO_4)_2$	800	Composite	10.0	64500		−2	281
536	$LiMg_{0.95}Co_{0.05}PO_4$+16.1 wt% TiO_2	875/2h	Composite	10.0	58200		1	111
537	Al_2O_3	1550	Hexagonal R-3c	10.1	680000		−60	201
538	$Y_2BaCu_{0.1}Ni_{0.9}O_5$		Orthorhombic Immm	10.1	5830	12.3	−36	58
539	$Mg_5Nb_4O_{15}$		$A_nB_{n-1}O_{3n}$ perovskite Orthorhombic	10.1	32300		−24	282
540	$CaW_{1-x}Te_xO_4$ (x=0.05)	850	Scheelite Teragonal $I4_1/a$	10.1	40500		−61	206

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
541	$CaW_{1-x}Te_xO_4$ (x=0.2)	850	Scheelite Tetragonal $I4_1/a$	10.1	44300		−60	206
542	$Ca_{1-x}Cd_xMoO_4$ (x=1)	900	Tetragonal $I4_1/a$	10.1	53200		−57	165
543	$LiMg_{0.9}Zn_{0.1}PO_4$+0.12 Vf TiO_2	950	Orthorhombic Pmnb Olivine type	10.1	52900		−5	82
544	$La_2Mo_3O_{12}$	930	Monoclinic C2/c	10.1	60000		−80	178
545	$0.55Li_2WO_4$-$0.45TiO_2$	730	Mixture	10.1	32800		−17	283
546	$Ca_5Co_4(VO_4)_6$	875	Cubic garnet Ia-3d	10.1	95200	10.6	−63	284
547	$CaMoO_4$-xY_2O_3-xLi_2O (x=0.066)	775	Composite	10.1	66000		−57	246
548	$AlTeO_6$-TeO_2	900/2h+ anneal/750		10.2	24300	13.3		285
549	$Y_3Al_5O_{12}$+1.3 wt% TiO_2	1550	Garnet Cubic Ia3d	10.2	80100		−30	286
550	$Bi_6B_{10}O_{24}$	700	Orthorhombic Pnma	10.2	10750		−41	287
551	$0.9(0.79ZnAl_2O_4$-$0.21Mg_2TiO_4)$-$0.1TiO_2$	1450	Composite	10.2	158000		−64	288
552	Al_2O_3, TiO_2 doped		Trigonal R-3c	10.2	119150			289
553	(1-x)$LiYW_2O_8$-x$BaWO_4$+y wt% B_2O_3 (x=0.46, y=0.5)	900	Mixed phases	10.2	24300		−21	48
554	$Ce_2(WO_4)_3$	1025	Monoclinic C2/c	10.2	10500		−25	290
555	$Ba_3ZrV_4O_{15}$	800	Orthorhombic Pnma	10.2	30600	8.5	−102	291
556	CaV_2O_6	675		10.2	123000	10.2	−60	292
557	$0.88ZnAl_2O_4$-$0.12TiO_2$	1380	Composite	10.3	79800	11.1	−22	198
558	$Mg_3Yb_4Al_{44}O_{75}$	1680	Magnetoplumbite	10.3	41000		−57	145
559	$Mg_3Dy_4Al_{44}O_{75}$	1680	Magnetoplumbite	10.3	28000		−49	145
560	$CaMo_{1.02}O_4$	1300/2h	Tetragonal $I4_1/a$	10.3	71000			293
561	$NdPO_4$	1300/2h	$P12_1/n1$ Monozite	10.3	59500		−47	146
562	$SmPO_4$	1400	Monoclinic $P2_1/n$	10.3	60500		−54	146
563	Li_3SbO_4+1 wt% B_2O_3	930	Monoclinic P2/c	10.3	14600	13.5	−28	294
564	$BaLa_2(MoO_4)$	800	Monoclinic	10.3	29800		−76	295
565	$(K_{0.5}La_{0.5})MoO_4$	680	Tetragonal $I4_1/a$	10.3	59000		−81	296
566	$Yb_3A_{l2}O_{12}$	1650	Cubic Garnet Ia-3d	10.3	12900		−70	297

567	$LaPO_4$	1400	Monoclinic $P2_1/n$	10.4	64500		−56	146
568	$SrEr_4Si_3O_{13}$	1500/4h	Hexagonal apatite $P6_3/m$	10.4	18100		−24	253
569	$Sr_2V_2O_7$	1000	Anorthic P-1	10.4	19500		−35	299
570	$Ba_2V_2O_7$	920/10h	Anorthic P-1	10.4	51600		−20	299
571	$Y_3Al_5O_{12}$	1650/24h	Cubic Ia3d	10.4	440000		−50	300
572	$SrCe_2(MoO_4)_4$	840		10.4	54100	8.08	−46	301
573	MgO-1.2Al_2O_3-2.8SiO_2-1.2TiO_2-0.8CeO_2	1150/2h	Composite	10.4	15300		−5	302
574	$ZnGa_2O_4$	1385	Cubic spinel Fd3m	10.4	94600		−27	303
575	$CaWO_4$	1100	Scheelite Tetragonal $I4_1/a$	10.4	76500		−24	49
576	CAS-TB glass (CaO:Al_2O_3:SiO_2:TiO_2:B_2O_3)	950	Composite	10.5	14200	10	−20	163
577	0.83$ZnAl_2O_4$-0.17TiO_2+10 wt% BBSZ+0.3 wt% LiF	925/10	Composite	10.5	14500	5.5	−28	269
578	$MgTe_2O_5$	700/4h	Orthorhombic Pbcn	10.5	61000	5.3	−45	304
579	$LiCa_3MgV_3O_{12}$	900	Cubic garnet Cubic Ia3d	10.5	74700		−61	305
580	$Mg_2V_2O_7$	950/10h	Triclinic Anorthic P-1	10.5	58200		−27	306
581	$Er_3Al_2O_{12}$	1600	Cubic Garnet Ia-3d	10.5	11700		−45	297
582	$Yb_3Al_2O_{12}$+1 wt% Ga_2O_3	1600	Cubic Garnet	10.5	50000		−50	297
583	$Na_{0.5}Nd_{0.5}MoO_4$	760		10.5	19600	9.15	−49	307
584	0.96$CaWO_4$-0.04$YLiF_4$	750/2h		10.5	73000		−38	308
585	0.83$ZnAl_2O_4$-0.17TiO_2+15 wt% BBSZ glass	950/10h	Composite	10.6	9300	5.5	−29	269
586	$MgTiO_3$-$CaTiO_3$ (MMT-20)+ SiO_2-B_2O_3-BaO	900	Composite	10.6	6000	7		177
587	$Ca_3ZrSi_2O_9$	1400	Monoclinic $P2_1/a$	10.6	93300		−77	189
588	$CaZrB_2O_6$+3 wt% Bi_2O_3-CuO	925		10.6	87350		2	173
589	$Ba_3SrSb_2O_9$		Complex perovskte Triclinic P-I	10.6	4600	9		243
590	0.8$SrMoO_4$-TiO_2.+3 wt% H_3BO_3-CuO	875	Composite	10.6	72000		−19	309
591	$Y_2BaCu_{0.7}Mg_{.0.3}O_{5\ CIP}$	1250	Orthorhombic Pbnm	10.6	29300	12.3	−44	123
592	0.8$BaMoO_4$-0.2TiO_2	1275	Composite	10.6	51800		−56	229

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
593	$0.55Li_2MoO_4$-$0.45TiO_2$	700	Mixture	10.6	30000		−5	283
594	$0.75MgAl_2O_4$-$0.25TiO_2$	1450	Composite	10.7	105400	7.5	−12	195
595	$CoWO_4$	1200	Wolframite Monoclinic P2/c	10.7	38600			264
596	$0.87[0.79ZnAl_2O_4$-$0.21Co_2TiO_4]$-$0.13TiO_2$	1350	Composite	10.7	86700		−62	310
597	$Ba_3ZrV_4O_{15}$	800	Orthorhombic Pnma	10.7	30600		−106	291
598	$Sm_2Mo_4O_{15}$	690	Triclinic (PI-)	10.7	63500	11.6	−50	311
599	$LiMg_4V_3O_{12}$	740/4h	Tetragonal	10.7	24000	9.65	−12	312
600	$BaZnV_2O_7$	720	Orthorhombic	10.7	31000	11.7	−64	182
601	$0.9ZnAl_2O_4$-$0.08CaTiO_3$		Composite	10.8	32300		0	313
602	$CaMoO_4$	1100	Scheelite Tetragonal $I4_1/a$	10.8	89700		−23	49,228
603	Nano Al_2O_3+0.5 wt% TiO_2	1400	Trigonal R-3c	10.8	680000	14		314
604	$CaCu_2Nb_2O_8$+3 wt% V_2O_5	935		10.8	9300		−16	315
605	$Er_3Al_2O_{12}$+1 wt% Ga_2O_3	1550	Cubic Garnet	10.8	12600		−37	297
606	$CaGe_2O_5$	1180	Monoclinic Pbam	10.9	39000	10		223
607	$Y_3Al_2O_{12}$+1 wt% Ga_2O_3	1600	Cubic Garnet	10.9	25000		−33	297
608	$0.7Ca_2P_2O_7$-$0.3TiO_2$	1200/2h	Composite	10.9	44000		−11	316
609	$0.83ZnAl_2O_4$-$0.17TiO_2$+10 wt% BBSZ glass	950/10h	Composite	10.9	12000	5.5	−23	269
610	$Ba_2V_2O_7$+6 mol% Li_2CO_3	750	Anorthic P-1	10.9	74500		−20	317
611	$CaWO_4$		Scheelite tetragonal $I4_1/a$	10.9	105600			228
612	Sr_2ZnTeO_6+1 wt% ZnO-B_2O_3-P_2O_5-TeO_2 glass	950	Not available	10.9	4250		−57	318
613	Mg_2YVO_6	1290/4h	Tetragonal $I4_1/amd$	10.9	68300		−54	298
614	$Ca_2ZnSi_2O_7$	1300	Tetragonal $P\text{-}42_1m$	11.0	13500		−64	133
615	MgO-Al_2O_3-SiO_2-TiO_2-CeO_2	1100/2h	Composite	11.0	12100		26	320
616	$0.76Mg_2SiO_4$-$0.24TiO_2$		Composite	11.0	85000		0	107,321
617	$Mg_3(VO_4)_2$-$0.2Ba_3(VO_4)_2$	950/5h	Composite	11.0	114000		−58	322
618	Sm_2BaCuO_5:Co		Orthorhombic Pnma	11.0	89000		−7	323
619	$NdBO_3$		Aragonite Orthorhombic	11.0	17000			135

620	Ba_2MgTeO_6+0.2 wt% B_2O_3	1200	Orthorhombic Pnam	11.0	25000	5.5	−16	324
621	$Sr_2CaSi_2O_7$	1300	Akermite Tetragonal P4-2$_1$m	11.0	13500		−64	133
622	Mg_2SiO_4+24 wt% TiO_2	1200	Composite	11.0	82000		0	87
623	Al_2O_3	1550	Trgonal R-3c	11.0	680000		−65	235
624	TiO_2-B_2O_3-: Ca-Al-Si-) glass		Glass	11.0	1400	10		163
625	$Mg_5Ta_4O_{15}$ (MgO calcined)	1560	Psuedo-brookite Orthorhombic Cmcm	11.0	18100	9.06	−54	325
626	$Mg_5Nb_4O_{15}$ (MgO calcined)	1450	Psuedo-brookite Orthorhombic Cmcm	11.0	37400	8.3	−53	325
627	$Mg_4Nb_2O_9$	1300	Trigonal P-3c1	11.0	210000		−70	274
628	0.50Li_2WO_4-0.5TiO_2	730	Mixture	11.0	32000		−3	283
629	TiP_2O_7	1250	Pyrophosphate	11.0	77000		−14	326
630	$Na_{0.5}La_{0.5}MoO_4$	740/2h		11.0	25100	8.83	−59	327
631	0.81$Mg_2Si_{0.9}V_{0.1}O_4$-0.19$Ca_{0.8}Sr_{0.2}TiO_3$+4 wt% LiF	900/4h	Multiphase	11.0	49000	9.5	−7	328
632	$(Mg_{4-x}Mn_x)Nb_2O_9$		Corundum Trigonal P-3c1	11-16	21000-50000			329
633	PbO:B_2O_3 (40:60) glass	469Td	Glass	11.1	1320	12.22	−43	92
634	$CePO_4$	1400/2h	Monoclinic P2$_1$/n	11.1	68500		−46	146
635	$Nd_4Mo_4O_{15}$	700	Triclinic (PI$^-$)	11.1	61500	12	−44	311
636	0.35$Ba_3(VO_4)_2$-0.65$BaWO_4$	925	Composite	11.1	79100		−2	330
637	0.8(0.79$ZnAl_2O_4$-0.21Mg_2TiO_4)-0.2TiO_2	1450	Composite	11.1	155100		−62	288
638	$Li_2Zn_2Mo_3O_{12}$	630	Lyonsite Orthorhombic Pnma	11.1	70000	14.6	−90	207
639	0.8[0.79$ZnAl_2O_4$-0.21 Co_2TiO_4]-0.2TiO_2	1350	Composite	11.1	98700		−63	310
640	$Tb_2Al_2O_{12}$+1 wt% Ga_2O_3	1500	Cubic Garnet	11.1	30000		−32	297
641	$Y_3Al_2O_{12}$+1 wt% Nb_2O_5	1625	Cubic Garnet	11.2	120000		−48	297
642	$NiCu_2Nb_2O_8$+3 wt% V_2O_5	935		11.2	5760		−11	315
643	$Cu_3Nb_2O_8$	910	Anorthic	11.2	25560		−4	315
644	$SrTm_4Si_3O_{13}$	1650/4h	Monoclinic apatiteP2$_1$/m	11.2	14400		−20	253

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
645	$SrEr_4Si_3O_{13}$+0.5 wt% ZBS glass		Hexagonal apatite $P6_3/m$	11.2	21000		−20	253
646	$Ba_3(PO_4)_2$-0.2$BaWO_4$	1100	Composite	11.2	71985		1.5	236
647	$Na_{0.5}Ce_{0.5}MoO_4$	780		11.2	19400	8.98	−44	331
648	$Mg_5Nb_4O_{15}$Sol-gel	1300	Psuedo brookite Orthorhombic	11.3	43300		−58	332
649	0.7$BaMoO_4$-0.3TiO_2	1285	Composite	11.3	52600		−34	229
650	$MgCu_2Nb_2O_8$+3 wt% V_2O_5	935		11.3	2900		−27	315
651	0.4$Ba_3(VO_4)_2$-0.6$BaWO_4$	925	Composite	11.3	75100		3	330
652	0.83$ZnAl_2O_4$-0.17TiO_2+3 wt% BBSZ	1300/4	Composite	11.3	35000		−14	269
653	$Li_2Zn_2W_3O_{12}$	700	Li_2WO_4+$ZnWO_4$	11.3	24500		−100	193
654	$ZnCu_2Nb_2O_8$+3 wt% V_2O_5	935	Not available	11.4	10200		−23	315
655	$LiMgPO_4$+0.15 vf TiO_2	950	Orthorhombic Pmnb	11.4	21100		4	67
656	$CaCe_2(MoO_4)_4$	840	Not available	11.4	52100	6.9	−44	301
657	(1-x)$Ba_2V_2O_7$-x$Ba_3(VO_4)_2$ (x=0.42)	875/4h	Composite	11.4	71700		−1	333
658	Li_2SnO_3	1325	Rock salt C2/c(15)	11.4	13100		14	334
659	Zn_2SnO_4+3 wt% ZnO-B_2O_3-SiO_2	1075/4h	Cubic spinel Fd-3m	11.4	33000		−107	335
660	$BaPr_2(MoO_4)_4$			11.5	24800			337
661	0.8$SrMoO_4$-0.2TiO_2	1300	Composite	11.5	19200		8	309
662	$Y_2BaCu_{0.4}Ni_{0.6}O_5$	1360/3h	Orthorhombic Pnma	11.5	45200	13.11	−20	259
663	$BaTi(BO_3)_2$	1000/2h	Trigonal R-3	11.5	2300			338
664	$Mg_4Ta_2O_9$	1450	Corundum Trigonal P-3c1	11.5	347000		−70	339
665	$Yb_3Ga_5O_{12}$	1400	Garnet Cubic Ia3d	11.5	60300		−12	340
666	$Mg_4Nb_{0.5}Ta_{1.5}O_9$	1100	Corundum type Trigonal P-3c1	11.5	25520			339
667	0.8$NaCa_2Mg_2V_3O_{12}$-0.2$CaTiO_3$	930/4h	Cubic garnet	11.5	37500		2	280
668	$LiCa_3ZnV_3O_{12}$	900	Cubic Garnet	11.5	81100	−72	–	341
669	$Li_3FeMo_3O_{12}$	580	Orthorhombiv Pnma	11.5	12000		−20	342
670	$(Na_{0.5}Bi_{0.5})_{0.1}Ca_{0.9}MoO_4$	850	Tetragonal Scheelite	11.5	35100		−52	343
671	$BaY_2(MO_4)_4$	925/2h	Monoclinic	11.5	47200	10.3	−35	344
672	$LiKSm_2(MoO_4)_4$	620	Monoclinic Sheelite	11.5	39000		−16	345
673	$Mg_4(Nb_{2-x}V_x)O_9$ (x=0.0625)	1025	Corundum type Trigonal P-3c1	11.6	160250		−75	346

674	$0.83ZnAl_2O_4$-$0.17TiO_2$+1 wt% BBSZ glass	1300/4h	Composite	11.6	49000		−10	269
675	$ZnAlO_4$-$0.21TiO_2$	1500/3h	Composite	11.6	74000	6.5	0	347
676	$CaCu_2Nb_2O_8$	1110		11.6	2300		−17	315
677	$CePO_4$	1400/2h	Monoclinic $P2_1/n$	11.6	68300		−46	146
678	$SrEr_4Si_3O_{13}$+0.5 wt% LBS glass	1475/4h	Hexagonal apatite $P6_3/m$	11.6	21000		−20	253
679	$0.88Al_2O_3$-$0.12TiO_2$+8 wt% MCAS glass	1350	Composite	11.6	11500		−3	348
680	$Ca_{2+x}La_{8-x}(SiO_4)_{6-x}(PO_4)O_2$ (x=6)	1425/4h	Hexagonal $P6_3/m$ apatite	11.6	12700		−35	349
681	$0.79ZnAl_2O_4$-$0.21TiO_2$	1500/3h	Composite	11.6	74000	6.5	0	350
682	$0.95[0.79ZnAl_2O_4$-$0.21Co_2TiO_4]$-$0.05SrTiO_3$	1425	Composite	11.6	49950		−2	310
683	$0.95(0.79ZnAl_2O_4$-$0.21Mg_2TiO_4)$-$0.05SrTiO_3$	1450	Composite	11.6	55000		9	288
684	$0.6LiYW_2O_8$-$0.4BaWO_4$	900	Mixed phases	11.7	19750		14	48
685	$Ca_5Zn_4(VO_4)_6$	725	Cubic garnet Ia3d	11.7	49400	9.7	−83	237
686	$Yb_2Ba(Cu_{0.75}Zn_{0.25})O_5$		Orthorhombic Pnma	11.7	11200		−43	149
687	$BaDy(MoO_4)_4$		Monoclinic	11.7	11500			337
688	$CaMoO_4$ (hot pressed)	1100	Tetragonal scheelite $I4_1/a$	11.7	55000		−60	293
689	$Ca_{0.8}(Nd_{0.5}Li_{0.5})_{0.2}WO_4$	825/2h	Tetragonal scheelite $I4_1/a$	11.7	36700		5	351
690	$0.83ZnAl_2O_4$-$0.17TiO_2$+0.2 wt% BBSZ	1400/4	Mixture	11.7	120000		−7	269
691	$0.83ZnAl_2O_4$-$0.17TiO_2$+0.1 wt% BBSZ	1425/4	Mixture	11.7	96000		−4	269
692	$BaNd_2(MoO_4)$	960	Monoclinic	11.7	45000	9.9	−41	352
693	$LiMg_{0.9}Zn_{0.1}PO_4$+0.15 Vf TiO_2	975	Orthorhombic Pmnb Olivine type	11.7	49800		17	82
694	MgO-$1.2Al_2O_3$-$2.8SiO_2$-$0.6CeO_2$	1200	Composite	11.7	17300		48	320
695	$(Mg_{4-x}Co_x)Nb_2O_9$ (x=0.5)	1200/10h	Corundum type Trigonal P-3c1	11.7	50700		−68	353
696	$Sr_2NaMg_2V_3O_{12}$	900/4h	Cubic garnet Ia-3d	11.7	37900		−3	354
697	$BaSm_2(MoO_4)$	960	Monoclinic	11.8	20000	9.7	−34	352
698	$0.9Al_2O_3$-$0.1TiO_2$+0.3 wt% Nb_2O_5	1550	Composite	11.8	8000		2	355
699	$0.94(0.79ZnAl_2O_4$-$0.21Mg_2TiO_4)$-$0.06CaTiO_3$	1400	Composite	11.8	88080		−8	288

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
700	$La(Mg_{1/2}Ti_{1/2})O_3$+B_2O_3-La_2O_3-MgO	800	Composite	11.8	14700		7.4	356
701	ZnO-B_2O_3-P_2O_5-TeO_2 glass annealed			11.8	3500		−90	318
702	0.85$CaWO_4$-0.15$LaNbO_4$+3 wt% H_3BO_3-1 wt% Li_2CO_3	900	Scheelite+second phases	11.8	45200		−23	357
703	$La(Mg_{0.5}Ti_{0.5})O_3$+0.6B_2O_3-0.12La_2O_3-0.28MgO	850/2h	Composite	11.8	14700		7	356
704	Y_2BaCuO_5	1250	Orthorhombic Pnma	11.8	3200	10.7	−38	244
705	Mg_4NbTaO_9	1100	Corundum type P-3c1	11.8	281670		−66	358
706	$LaBO_3$	1300	Orthorhombic Pmcn	11.8	76900	15	−52	359
707	$Mg_4Nb_{1.5}Ta_{.5}O_9$	1100	Corundum type Trigonal P-3c1	11.9	234520		−67	358
708	Li_2MnO_3+2 wt% BCB	1200/4h	Monoclinic C2/c	11.9	80600		0	360
709	BaO-SrO-SiO_2-ZrO_2	<1000	Composite	12.0	1000	5		361
710	$CoCu_2Nb_2O_8$+3 wt% V_2O_5	885		12.0	7530		−18	315
711	CaO-4Co_3O_4-Nb_2O_5-TiO_2	1100	Mixture	12.0	28000	6.9	−42	230
712	$Mg_4(TaNb_{1-x}V_x)O_9$ (x=0.025)	1200	Corundum type Trigonal P-3c1	12.0	200000		−73	362
713	$Mg_4Ta_2O_9$	1250	Corundum type P-3c1	12.0	347000		−65	235
714	$AlNbO_4$	1250	Monoclinic fergusonite C2/m	12.0	34000		−56	363
715	0.85$CaWO_4$-0.$SmNbO_4$+1 wt% Li_2WO_4	800	Composite	12.0	13300		−28	364
716	$Ba_3(VO_4)_2$+60 wt% $CaWO_4$	900	Composite	12.0	37000		−1	365
717	$Ba_3V_4O_{13}$	700/4h	Monoclinic C2/c	12.0	22500		−67	366
718	$Ca_4Tb_6(SiO_4)_4(PO_4)_2O_2$		Hexagonal Apatite $P6_3/m$	12.0	19000		−10	367
719	$Mg_{3-x}Ca_xV_2O_8$ (x=9/4)	950		12.0	5700		15	368
720	$Ca_2V_2O_7$	920	Anorthic Triclinic P-1	12.1	15400		−32	299
721	0.8$CaMoO_4$-0.2TiO_2+3 wt% H_3BO_3-CuO	875	Composite	12.1	53300		−16	309
722	0662$BaMoO_4$-0.338TiO_2	1285	Composite	12.1	41600		−25	229
723	0.76$SrMoO_4$-0.24TiO_2+3 wt% H_3BO_3-CuO	900	Composite	12.1	40700		10	309
724	PbO:B_2O_3:SiO_2 (40:20:40) glass		Glass	12.1	1420	12.2	−31	92

725	$MgWO_4$	1200	Wolframite Monoclinic P-2/c	12.1	41800		−45	48,49
726	$Li_{0.8}Mg_{4.1}V_3O_{12}$	760	Tetragonal	12.1	21800		2	248
727	$5BaO\text{-}2V_2O_5$	900/1h	Composite	12.1	26800		7	255
728	$Ca(Mg_{0.92}Al_{0.08})(Si_{0.96}Al_{0.04})_2O_6$+22 wt% TiO_2	1225	Mixture	12.1	6000		2	258
729	$Y_2BaCu_{0.75}Zn_{0.25}O_5$	1250	Orthorhombic Pnma	12.2	25660	11.5	−40	244
730	$Dy_3Ga_5O_{12}$	1450	Cubic Garnet Ia3d	12.2	42100	14.6	−22	340,369
731	$0.76SrMoO_4\text{-}0.24TiO_2$	1300	Composite	12.2	21700		40	309
732	$0.92MgAl_2O_4–0.08(Ca_{0.8}Sr_{0.2})TiO_3$	1440/ 20 min	Composite	12.2	56200		−3	370
733	$0.88Al_2O_3\text{-}0.12TiO_2$+2 wt% MCAS glass	1350	Composite	12.3	20485		2.5	348
734	$BaCe_2(MoO_4)_4$	840	Monoclinic	12.3	24700	7.5	−37	301,371
735	$Mg_4Nb_2O_9$ sol-gel	1250	Corundum type P-3c1	12.3	165000		−48	372
736	$Ca_{2+x}La_{8-x}(SiO_4)_{6-x}(PO_4)O_2$ (x=4)	1675/4h	Hexagonal $P6_3/m$ apatite	12.3	15900		−28	349
737	$Mg_3CoNb_2O_9$	1150	Corundum type P-3c1	12.3	34560		−64	358
738	Yb_2BaZnO_5		Orthorhombic Pnma	12.3	27000		−60	149
739	$0.72Ba(Mg_{1/2}W_{1/2})O_3\text{-}0.28BaTiO_3$	1500/6h	Perovskite	12.3	11000		−5	373
740	$Sm_3Ga_5O_{12}$+TiO_2	1450	Garnet cubic Ia3d	12.3	234700	14.1	−16	369
741	$Sm_3Ga_5O_{12}$	1450	Garnet cubic Ia3d	12.3	192200	14	−19	369
742	$(Mg_{4-x}Co_x)Nb_2O_9$ (x=1)	1200/10h	Corundum typeTrigonal P-3c1	12.3	34500		−64	358
743	$Ba_3V_2O_8$	1300/1h	Hexagonal	12.3	52200		42	255
744	$0.50Li_2MoO_4\text{-}0.5TiO_2$	720	Mixture	12.3	27000		23	283
745	$CeVO_4$	950	Tetragonal zircon	12.3	41500		−35	374
746	$Na_2YMg_2V_3O_{12}$	850	Cubic garnet Ia-3d	12.3	23200	10.2	−4	375
747	$Nd_3Ga_5O_{12}$	1400	Garnet Cubic Ia-3d	12.4	137800	13.8	−33	369
748	$0.9Al_2O_3\text{-}0.1TiO_2$Annealed at 1000 C	1350	Composite	12.4	117000		1.5	376
749	$Al_2O_3\text{-}TiO_2$:MnO	1300	Composite	12.4	274000	76	0	377
750	$0.9Al_2O_3\text{-}0.1TiO_2$	1300/2h	Composite	12.4	148000		2	378
751	$(1\text{-}x)LiYW_2O_8\text{-}xBaWO_4$+y wt% B_2O_3 (x=0.2, y=0)	900	Mixed phases	12.4	12100		33	48
752	$Ce_2(WO_4)_3$	1000	Monoclinic C2/c	12.4	10500	4.8	−39	290

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
753	$0.9LiCa_3MgV_3O_{12}$+0.1$CaTiO_3$	925/4h	Cubic garnet Ia3d	12.4	57600		3	305
754	$Mg_4Nb_2O_9$	1200/10h	Corundum typeTrigonal P-3c1	12.4	192200		−71	358
755	Mg_4NbSbO_9	1500	Corundum type Trigonal P-3c1	12.5	275000		−45	379
756	$0.895Al_2O_3$-$0.105TiO_2$	1350	Composite	12.5	340000	80	2	380
757	$Eu_3Ga_5O_{12}$	1400	Garnet cubic Ia3d	12.5	169100	14.6	−17	369
758	$LaBO_3$		Orthorhombic Pncn	12.5	53000			135
759	$Ba_3ZnNb_{2-x}Sb_xO_9$ (x=1.875)		Perovskite Pm3m cubic	12.5	2290	7.6		381
760	$Ba_3(VO_4)_2$+0.5 wt% B_2O_3	950	Trigonal R-32m	12.5	41065		39	108
761	$NaMg_4V_3O_{12}$	690	Tetragonal I-42d	12.5	35900	10.5	−58	382
762	$Mg_4Nb_2O_9$+3 wt% LiF	950/10h	Corundum type Trigonal P-3c1	12.6	116410		−72	273
763	$0.83ZnAl_2O_4$-$0.17TiO_2$	1410	Composite	12.6	100200	10	0	198,383
764	$Yb_2Ba(Cu_{0.25}Ni_{0.75})O_5$		Orthorhombic Immm	12.6	50040		−41	149
765	$YSmBaCuO_5$		Orthorhombic	12.6	25130	11	−30	384
766	$Mg_3(VO_4)_2$-$0.5Ba_3(VO_4)_2$+0.0625 wt% Li_2CO_3	950/5h	Composite	12.6	74400		−6	322
767	$SrGd_4Si_3O_{13}$	1525/4h	Hexagonal apatite $P6_3/m$	12.6	8800		−20	253
768	1-x($0.79ZnAlO_4$-$0.21Co_2TiO_4$)-x$CaTiO_3$ (x=0.08)	1400	Composite	12.6	67500		−1	310
769	$SrY_4Si_3O_{13}$	1575/4h	Hexagonal apatite $P6_3/m$	12.6	20500		−18	253
770	$0.7LiZnVO_4$-$0.3TiO_2$	680	Composite	12.6	38000		5	140
771	$Li_2Mg_3ZrO_6$	1380	Cubic rocksalt Fm-3m	12.6	86000	9.3	−36	222
772	$Mg_4Nb_2O_9$/MgO	1400	Composite	12.6	196700		−47	385
773	$(La_{0.5}Na_{0.5})_{1-x}$-$(Na_{0.5}Nd_{0.5})_xWO_4$ (x=0.3)	800/2h	Composite	12.7	23500		−1	386
774	$0.9Al_2O_3$-$0.1TiO_2$	1300	Composite	12.7	176000		−14	387
775	$YTmBaCuO_5$		Orthorhombic	12.7	17900	10.6	−27	384
776	$PbO:B_2O_3:SiO_2$ (40:40:20) glass		Glass	12.7	1700	12	−69	92
777	$[(Li_{0.5}Bi_{0.5})_{0.1}Ca_{0.9}]MoO_4$	850	Scheelite Tetragonal $I4_1/a$	12.7	41300	10	−17	388
778	$(Mg_{0.95}Zn_{0.05})_4Ta_2O_5$			12.7	385000		−62	389
779	Tm_2BaCuO_5	1250	Orthorhombic Pmna	12.8	14400	9.77	−15	384
780	$NiCu_2Nb_2O_8$	985		12.8	4240		481	315

781	$SrTm_4Si_3O_{13}$+0.5 wt% LBS glass	1575/4h	Apatite monoclinic $P2_1/m$	12.8	16500		−26	253
782	$0.8CaMoO_4$-$0.2TiO_2$	1325	Composite	12.8	29310		10	309
783	Li_2SnO_3	1230	Monoclinic C2/c	12.8	20800		27	390
784	$(Mg_{4-x}Co_x)Nb_2O_9$ (x=1.5)	1200/10h	Corundum typeTrigonal P-3c1	12.8	20500		−63	358
785	$LiEr_9(SiO_4)_6O_2$	1250/4h	Apatite, Hexagonal $P6_3/_m$	12.8	1300		17	391
786	$SrYb_4Si_3O_{13}$+0.5 wt% LBS glass	1425/4h	Hexagonal apatite $P6_3/m$	12.9	12000		−27	253
787	$BaTa_2P_2O_{11}$	1200	Rhombohedral R-3c	12.9	28900		−29	392
788	$Y_2Ba_{0.7}Sr_{0.3}CuO_5$		Orthorhombic Pnma	12.9	2960	10.7	2	393
789	$0.89Al_2O_3$-$0.11TiO_2$-0.5 wt% ZnO	1350	Composite	12.9	187000		−2	394
790	$Mg_4Nb_2O_9$	1300/10h	Trigonal P-3c1	12.9	217390	–	−70	346,358
791	$Na_2Mo_2O_7$	575	Orthorhombic Cmca	12.9	62400		−72	11
792	$Mg_3La_4Al_{44}O_{75}$	1680	Magnetoplumbite	13.0	7700		3	145
793	2CaO-3ZnO-Ta_2O_5-TiO_2	1300	Composite	13.0	20000	6.6	−24	230
794	$Ba_3ZnNb_{2-x}Sb_xO_9$ (x=2)		Perovskite	13.0	1550	7.7		381
795	$Ba_3(VO_4)_2$	1200	Rhombohedral $R3_2/m$	13.0	46700		17	322
796	$Mg_3(VO_4)_2$-$0.5Ba_3(VO_4)_2$+0.0625 wt% Li_2CO_3	950/5h	Composite	13.0	74000		−6	322
797	$SrDy_4Si_3O_{13}$+0.5 wt% LBS glass	1425/4h	Hexagonal apatite $P6_3/m$	13.0	9500		28	253
798	Mg_4NbSbO_9	1500	Corundum type Trigonal P-3c1	13.0	275000			395
799	$(Mg_{0.95}Zn_{0.05})_4Nb_2O_9$	1340/4h	Corundum Trigonal P-3c1	13.0	247000		−67	396
800	$0.77CaMoO_4$-$0.23TiO_2$+3 wt% H_3BO_3-CuO	900	Composite	13.0	57400		−5	309
801	$Li_3(Mg_{0.95}Mn_{0.05})_2NbO_6$	1140/4h	Fdd	15.6	52200	8.9	−20	397
802	$(Mg_{0.95}Zn_{0.05})_2(Ti_{0.8}Sn_{0.2})O_4$	1150/5h	Spinel Cubic Fd3m	13.1	119310	10	−59	398
803	$SrYb_4Si_3O_{13}$	1525/4h	Hexagonal apatite $P6_3/m$	13.1	11400		−25	253
804	Sr_2ZnTeO_6+2 wt% ZnO-B_2O_3-P_2O_5-TeO_2 glass	950	Composite	13.1	4300		−53	318
805	$0.67Ba(Mg_{1/2}W_{1/2})O_3$-$0.33BaTiO_3$	1500/6h	Perovskite	13.1	35000		−6	373
806	$MgWO_4$	1150	Wolframite MonoclinicP12/c1	13.1	69000		−58	150
807	$MgWO_4$+9 wt% Li_2CO_3	950	Composite	13.1	20000		−75	399
808	Ba_2SiO_4	1525	Orthorhombic Pmcn	13.1	17900		−17	210

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
809	Al_2O_3-WO_3-TiO_2	1150	Multiphase	13.2	3580	6.9	12	400
810	$Mg_2Co_2Nb_2O_9$		Corundum type Trigonal P-3c1	13.2	14300		−51	358
811	CeO_2+20 wt% B_2O_3	900	Cubic flurite Fm3m	13.2	24200	4.3	−46	401
812	$(Mg_{0.95}Ca_{0.05})TiO_3$+BaO-$B_2O_3$-$SiO_2$(50:50 wt%)	900	Composite	13.2	10000		–	402
813	Ca_2MgTeO_6+0.2 wt% B_2O_3	1250	Perovskite	13.2	81000	5.5	−81	324
814	$LiGd_9(SiO_4)_6O_2$	1250/4h	Apatite, Hexagonal P63/m	13.2	6900		23	391
815	$Ba_2Ti_9O_{20}$+50 vol% BBS glass	900	Composite	13.2	1150			338
816	$LiCa_3ZnV_3O_{12}$-0.2$CaTiO_3$	925	Cubic Garnet	13.2	59600	1		341
817	0.5$MgAl_2O_4$-0.5TiO_2	1460	Composite	13.2	88000	6.8	−4	195
818	$Ni_{1-x}(Zn_{1/2}Zr_{1/2})_xW_{1-x}Nb_xO_4$ (x=0.25)		Monoclinic Wolframite P2/c	13.2	28700		−29	403
819	$YErBaCuO_5$		Orthorhombic	13.3	16050	10.6	−34	384
820	$NiWO_4$	1200	Wolframite Monoclinic P2/c	13.3	24900			264
821	0.7$CaWO_4$-0.3$LaNbO_4$	1150	Composite	13.3	50000		−9	279
822	$(Na_{0.5}Bi_{0.5})_{0.2}Ca_{0.8}MoO_4$	850	Scheelite Tetragonal	13.3	32900		−42	343
823	0.8$Mg_{1.9}Cu_{0.1}SiO_4$-0.2$(La_{0.5}Na_{0.5})TiO_3$+4 wt% LiF	950	Orthorhombic	13.3	14400		6	404
824	$Sm_2BaCu_{0.5}Zn_{0.5}O_5$	1280	Orthorhombic Pnma	13.4	65740	10.6	−6	405
825	Sr_2ZnTeO_6+5 wt% ZnO-B_2O_3-P_2O_5-$Te0_2$ glass	950	Composite	13.4	4500		−52	318
826	$BaTa_2P_2O_{11}$+5 wt% TiO_2	1250	Rhombohedral R-3c	13.4	17200		−6	392
827	0.47$Mg_4Nb_2O_9$–0.53(0.5$ZnAl_2O_4$-0.5TiO_2)	1390/4h	Composite	13.4	210000		−2	406
828	0.77$CaMoO_4$-0.23TiO_2	1325	Composite	13.4	31300		33	309
829	Sr_2ZnTeO_6+5 wt% ZnO-B_2O_3-P_2O_5-TeO_2 glass	950	Composite	13.4	4500		−2	318
830	$Mg_5Nb_4O_{15}$+5 wt% B_2O_3	1300/4h	Multiphase	13.4	55700		−55	319
831	Er_2BaCuO_5		Orthorhombic Pnma	13.5	12560	11	−26	384
832	0.64$Ba(Mg_{1/2}W_{1/2})O_3$-0.36$BaTiO_3$	1500/6h	Perovskite	13.5	14000		−6	373,407

833	$ZnWO_4$	1200	Wolframite Monoclinic P2/c	13.5	62800			264
834	$SrSm_4Si_3O_{13}$	1375/4h	Hexagonal apatite $P6_3/m$	13.5	20800		−28	253
835	$Mg_4Nb_2O_9$+0.75 wt% Fe_2O_3	1240	Corundum type Trigonal P-3c1	13.5	280000		−62	408
836	Li_2SnO_3		Monoclinic C2/c	13.5	61600		29	409
837	$SrY_4Si_3O_{13}$+0.5 wt% LBS glass	1475/4h	Hexagonal apatite $P6_3/m$	13.5	21500		−18	253
838	$ZnW_{1-x}Te_xO_4$ (x=0.05)	900	Wolframite $P2_1/n$	13.5	22500		−66	206
839	$MgWO_4$	1050	Monoclinic P2/c	13.5	69000		−58	150
840	$Li_8Bi_2Mo_7O_{28}$	540	Tetragonal	13.6	8000	9.2	−59	30
841	Te_2MoO_7	520	Monoclinic $P2_1/c$	13.6	46900		−36	410
842	$Ba_3TiV_4O_{15}$	800	Orthorhombic Pnma	13.6	31800	8.6	10	291
843	Li_2MnO_3	930/4h	Monoclinic C2/c	13.6	97000		−5	360
844	$BaY_2(MoO_4)_4$-0.5TiO_2	970/2h	Composite	13.6	30800	9.6	1	411
845	$Ce_2(WO_4)_3$+0.2 wt% ZBS	900	Monoclinic C2/c	13.7	20200		−25	290
846	Li_2SnO_3+1 wt% BaO-CuO	900	Monoclinic C2/c	13.7	36400		27	390
847	$Ca_{2+x}La_{8-x}(SiO_4)_{6-x}(PO_4)O_2$ (x=0)	1475/4h	Hexagonal $P6_3/m$ apatite	13.7	33100		−29	349
848	$ZnMnW_2O_8$	950		13.7	10670		−17	48
849	PbO:B_2O_3:SiO_2 (50:40:10) glass	409 Td	Glass	13.8	880	10.7	−98	92
850	$Y_2BaCu_{0.2}Ni_{0.8}O_5$	1390/3h	Othorhombic Pnma	13.8	87200	12.8	−17	259
851	$Ba_2CeV_3O_{11}$	1025		13.8	10000		−14	366
852	$Ca_{2+x}La_6(SiO_4)_4(PO_4)O_2$ (x=2)	1475/4h	Hexagonal $P6_3/m$ apatite	13.8	27900		−11	349
853	$Ca_4La_4Pr_2(SiO_4)_4(PO_4)_2O_2$	1475	Hexagonal apatite $P6_3/m$	13.8	26000		−7	367
854	$Ca_4La_2Pr_4(SiO_4)_4(PO_4)_2O_2$	1475	Hexagonal apatite $P6_3/m$	13.8	21800		−5	367
855	0.6$BaMoO_4$-0.4TiO_2	1285	Composite	13.8	40500		−6	229
856	Nd_2MoO_6	1350/4h	Tetragonal I-42m	13.8	66400		−53	412
857	$Te_2(Mo_{0.95}W_{0.05})O_7$	520	Monoclinic $P2_1/c$	13.9	25800		−13	410
858	Sr_2ZnTeO_6+10 wt% ZnO-B_2O_3-P_2O_5-TeO_2	900	Composite	13.9	3300		−58	318
859	$SrNdSi_3O_{13}$+0.5 wt% LBS glass	1350/4h	Hexagonal apatite $P6_3/m$	13.9	20500		−33	253
860	$SrSm_4Si_3O_{13}$+0.5 wt% LBS glass	1350/4h	Hexagonal apatite $P6_3/m$	13.9	21800		−28	253
861	1-xCeO_2-xY_2O_3 (x=0.5)	1650	Cubic flurite Fm3m	13.9	35000		−53	413
862	$YHoBaCuO_5$		Orthorhombic	13.9	12056	10.7	−30	384

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
863	$Mg_4Ta_2O_9$	1200	Corundum type P-3c1	14.0	350000	–	−60	339
864	$YDyBaCuO_5$		Orthorhombic	14.0	42600	10.8	−22	384
865	$LaMgAl_{11}O_{19}$	1700	Hexagonal P63/mmc	14.0	28000	7	−12	414
866	$Y_2BaCu_{0.75}Zn_{0.25}O_5$	1270	Orthorhombic Pnma	14.0	56230	10.8	−39	244
867	$Mg_5Nb_4O_{15}$	1475	Psuedobrookite Orthorhombic Cmcm	14.0	14600	7.3	−58	325
868	$5Co_3O_4$-Ta_2O_5-TiO_2	1150	Mixture	14.0	48000	6.5	−43	230
869	$0.2ZnAl_2O_4$-$0.8Co_2TiO_4$		Not available	14.0	148800		−52	239
870	$Mg_3Ce_4Al_{44}O_{75}$	1680	Magnetoplumbite	14.0	9000		11	145
871	$Ba_3NiSb_2O_9$		Perovskite	14.0	41840	7.8	−5	381
872	$YGdBaCuO_5$		Orthorhombic	14.0	14300	10.9	−35	384
873	$0.80ZnAl_2O_4$-$0.20TiO_2$	1420	Spinal cubic Fd3m composite	14.0	90700	9.66	6	198
874	$Ba[Ti_{0.39}(Co_{0.5}W_{0.5})_{0.61}]O_3$	1400	Perovskite	14.0	7700		−14	415
875	$Li_3(Mg_{0.92}Zn_{0.08})2NbO_6$+0.5 wt% $0.17Li_2O$-$0.83V_2O_5$	925/2h	Orthorhombic Fddd	14.0	83400		−37	416
876	$0.662BaMoO_4$-$0.338TiO_2$+5 wt% H_3BO_3+1 wt% CuO	875	Composite	14.0	48300		14	229
877	Li_2ZrO_3	1200	Tetragonal	14.1	17600		39	390
878	Li_3TaO_4+1 wt% B_2O_3	930	Rock salt type	14.1	29900	12.4	−48	294
879	$LiEu_9(SiO_4)_6O_2$	1250/4h	Apatite, Hexagonal $P6_3/m$	14.1	7100		8	391
880	$[(Li_{0.5}Bi_{0.5})_{0.15}Ca_{0.85}]MoO_4$	760	Scheelite tetragonal $I4_1/a$	14.1	24000	10.3	11	388
881	$Yb_2Ba(Cu_{0.5}Zn_{0.5})O_5$			14.2	20630		−48	149
882	$Y_2BaCu_{0.5}Zn_{0.5}O_5$	1270	Orthorhombic Pnma	14.2	110660	10.7	−42	244
883	Mg_2TiO_4	1500	Cubic spinel Fd3m	14.2	160000		−50	417,418
884	$0.8(Al_{1/2}Ta_{1/2})O_2$-$0.2(Mg_{1/3}Ta_{2/3})O_2$	1450	Composite	14.2	62150		−41	214
885	80 wt% (La_2O_3-B_2O_3-TiO_2 in 20:60: 20 mol%)+20 wt % $BaNd_2Ti_5O_{14}$	850	Composite	14.2	9800	7.5	94	419
886	$SrLa_4Si_3O_{13}$	1325/4h	Hexagonal apatite $P6_3/m$	14.2	26300		−46	253
887	$SrEu_4Si_3O_{13}$+0.5 wt% LBS glass	1425/4h	Hexagonal apatite $P6_3/m$	14.2	19800		−22	253
888	$LiLa_9(SiO_4)_6O_2$	1250/4h	Apatite, hexagonal $P6_3/m$	14.2	7300		18	391

889	$LiSm_9(SiO_4)_6O_2$	1250/4h	Apatite, Hexagonal $P6_3/m$	14.2	8500		2	391
890	$LiNd_9(SiO_4)_6O_2$	1250/4h	Apatite, Hexagonal $P6_3/m$	14.2	6400		12	391
891	$Ba_3(VO_4)_2$	925	Trigonal R-3_2/m	14.2	42200		52	330
892	$Ba_2BiV_3O_{11}$	870	Monoclinic $P2_1/c$	14.2	68700	8.7	−81	420
893	$LaVO_4$	850	Monoclinic Monazite	14.2	48200		−38	374
894	$SrTb_4Si_3O_{13}$+0.5 wt% LBS glass	1425/4h	Hexagonal apatite $P6_3/m$	14.3	23500		10	253
895	$0.2ZnAl_2O_4$-$0.8Co_2TiO_4$		Composite	14.3	148000		−53	239
896	$SrTb_4Si_3O_{13}$	1500/4h	Hexagonal apatite $P6_3/m$	14.3	19300		6	253
897	$LiY(W_{1-x}Te_x)_2O_8$ (x=0.2)	850	Monoclinic	14.3	4000		−6	421
898	$Mg_{0.95}Co_{0.05}TiO_3$	1275/4h	Ilmenite Trigonal R-3	14.3	128000	7	−51	422
899	Sr_2MgTeO_6+0.2 wt% B_2O_3	1250	Cubic Fm3m	14.3	27400	5.5	−60	324
900	BaO-0.35MgO-0.33WO_3-0.32TiO_2	1500/6h	Perovskite Hexagonal	14.4	74000		−9	373
901	BaO+0.34MgO-0.32WO_3-0.34TiO_2	1500/6h	Perovskite Hexagonal	14.4	87000		−7	373
902	$Sm_2BaCu_{0.75}Zn_{0.25}O_5$	1280	Orthorhombic Pnma	14.4	47000	10.6	−7	405
903	$La_2Sn_2O_7$	1580/34h	Cubic Fd3m	14.4	40500		−54	423
904	$Ca_{1-x}(La_{0.5}Na_{0.5})_xWO_4$+30 mol%$TiO_2$ (x=0.9)	850/2h	Composite	14.4	14300		−9	424
905	80 wt% (La_2O_3-B_2O_3-TiO_2 in 20:60:20 mol%)+20 wt % $BaNd_2Ti_5O_{14}$	800	Composite	14.5	9100	7.5	86	419
906	BaO-0.34MgO-0.32WO_3-0.34TiO_2	1500/12h	Perovskite Hexagonal	14.5	107000		−8	373,407
907	$Mg_3Pr_4Al_{44}O_{75}$	1680	Magnetoplumbite	14.5	10000		23	145
908	$Y_2BaCu_{0.6}Ni_{0.4}O_5$	1340	Orthorhombic Pnma	14.5	36000	14.5	26	259
909	$MnWO_4$	1000	Monoclinic P2/c	14.5	32000		−64	150
910	Ba_2SiO_4	1525/4h	Orthorhombic Pmcn	14.5	17900		−17	210
911	Ca_4La_6 $(SiO_4)_4(VO_4)_2O_2$	1475	Hexagonal apatite $P6_3/m$	14.5	22000		−20	367
912	Mg_2TiO_4+1.5 wt% CeO_2 nano particles		Spinel Fd3m	14.6	167000			425
913	$(Mg_{0.97}Zn_{0.03})(Ti_{0.95}Sn_{0.05})O_4$	1390/4h	Cubic spinel	14.6	183500		−44	426
914	$Ba_3MgNb_{2-x}Sb_xO_9$ (x=0.5)		Perovskite	14.7	81300	6.3	5	381
915	$Zn_3Nb_2O_8$+3 wt% (0.29$BaCO_3$+0.71CuO)	950	Monoclinic C2/c	14.7	8200	8.3		427
916	$SrLa_4Si_3O_{13}$+0.5 wt% LBS glass	1300/4h	Hexagonal apatite $P6_3/m$	14.7	25800		−40	253

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
917	$Cu_2ZnNb_2O_8$+1 wt% LBS glass	935	Triclinic	14.7	5100		−18	428
918	$Cu_2ZnNb_2O_8$+0.7 wt% LMZBS glass	935	Triclinic	14.8	2500		−39	428
919	$SrEu_4Si_3O_{13}$	1450/4h	Hexagonal apatite $P6_3/m$	14.8	20700		−24	253
920	$LiYW_2O_8$	900	Monoclinic	14.8	9550		−64	48
921	$0.2(Li_{1/2}Nd_{1/2})WO_4$-$0.8ZnWO_4$	850/4h	Tetragonal $I4_1/n$	14.8	1370		−20	429
922	$Li_2Zn_2W_2O_9$	790	Corundum	14.7	15700	9.7	−77	430
923	$Ni_{1-x}(Zn_{1/2}Zr_{1/2})_xW_{1-x}Nb_xO_4$ (x=0.5)		Monoclinic wolframite P2/c	14.8	32650		−35	403
924	$Ba_3NiNb_{2-x}Sb_xO_9$ (x=1.875)		Perovskite	14.8	38380	6.8	−10	381
925	$Yb_2Ba(Cu_{0.25}Zn_{0.75})O_5$			14.9	52810		−45	149
926	Dy_2BaCuO_5		Orthorhombic Pnma	14.9	31610	10.56	−6	384
927	1-xCeO_2-xGd_2O_3 (x=0.5)	1650	Cubic flurite Fm3m	14.9	15300		−62	413
928	$0.1ZnAl_2O_4$-$0.9Co_2TiO_4$		Composite	14.9	130000		−50	239
929	$Ba_2CeV_3O_{11}$	1025		14.9	12700	5	−15	366
930	$Bi_4(SiO_4)_3$	900	Cubic I-43d	14.9	36000		−9	431
931	$ZnW_{1-x}Te_xO_4$ (x=0.1)	900	Wolframite $P2_1/n$	14.9	27700		−65	206
932	$0.8ZnAl_2O_4$-$0.2Co_2TiO_4$		Composite	15.0	148000		−50	239
933	Sr_2TiO_4	1300/5h	Tetragonal I4/mmm	15.0	1600	4		53
934	5MgO-Nb_2O_5-TiO_2	1325	Mixture	15.0	59000	6.8	−77	230
935	$Mg_3Nd_4Al_{44}O_{75}$	1680	Magnetoplumbite	15.0	11000		35	145
936	$Ba_3MgNb_{2-x}Sb_xO_9$ (x=1.875)		Perovskite	15.0	84100	7.25	2.8	381
937	$Ba(Mg_{1/2}W_{1/2})O_3$	1550	Perovskite cubic Fm3m	15.0	57300	12.7		432
938	$BiZn_2VO_6$	780/4h	Triclinic P-1	15.0	20650		−88	433
939	BaO-0.34MgO-0.33WO_3-0.33TiO_2	1500/6h	Perovskite hexagonal	15.1	72000		−13	373
940	Al_2O_3+Ca-Al-B-Si-O+Ba-(Sm,Nd)-Ti-O	870	Composite	15.1	2800	3		215
941	$Ba_2CeV_3O_{11}$+1 wt% ZnO-B_2O_3-SiO_2	825		15.1	20300	4.9	−21	366
942	$CeTe_2O_6$	680	Monoclinic $P2_1/n$	15.2	45400		−68	434
943	$Y_2BaCu_{0.25}Zn_{0.75}O_5$	1270	Orthorhombic Pnma	15.2	70080	9.95	−42	244
944	$(Mg_{4-x}Co_x)Nb_2O_9$ (x=3)	1200/10h	Corundum typeTrigonal P-3c1	15.2	2200		−36	358
945	Ca_4La_6 $(GeO_4)_4(PO_4)_2O_2$	1475	Hexagonal apatite $P6_3/m$	15.2	20400		−11	367
946	$Ni_{1-x}(Zn_{1/2}Zr_{1/2})_xW_{1-x}Nb_xO_4$ (x=0.75)		Monoclinic Wolframite P2/c	15.2	41250		−45	403

947	$Li_3(Mg_{0.95}Ni_{0.05})_2NbO_6$	1140/4H	Fdd	15.2	84800	8.9	−23	397
948	$Li_2Mg_3TiO_6$	1280	Cubic rocksalt Fm-3m	15.2	152000	8.3	−39	222
949	Ho_2BaCuO_5		Orthorhombic Pbnm	15.3	9360	10.48	−19	384
950	$LaSrAlO_4$	1375	Tetragonal I4/mmm	15.3	32820		−17	435
951	$PbO:B_2O_3:SiO_2$ (60:20:20) glass	348 Td	Glass	15.3	650	11.72	−124	92
952	$LiPr_9(SiO_4)_6O_2$	1250/4h	Apatite, hexagonal $P6_3/m$	15.3	6400		33	391
953	Ca_3WO_6	1275	Monoclinic $P2_1/n$	15.3	29200		−30	436
954	$ZnW_{1-x}Te_xO_4$ (x=0.15)	900	Wolframite Monoclinic $P2_1/n$	15.3	41700		−61	206
955	$0.8(Mg_{0.95}Co_{0.05})_4Ta_2O_9$-$0.2CaTiO_3$	1375/4h	composite	15.3	390500		−35	437
956	Y_2BaZnO_5	1270	Orthorhombic Pnma	15.4	189000	10	−41	244
957	$Y_2Ba(Cu_{1/4}Zn_{3/4})O_5$		Orthorhombic Pbnm	15.4	220000		−65	235
958	BaO-$0.35MgO$-$0.34WO_3$-$0.31TiO_2$	1500/6h	Perovskite hexagonal	15.4	77000		−8	373
959	$Ba(Mg_{1/3}Ta_{(2-2x)/3}W_{x/3}Ti_{/3})O_3$ (x=1)	1550/4h	Perovskite Trigonal P-3m1	15.4	35400		−25	438
960	$0.8MgTiO_3$−$0.2Mg_{2.05}SiO_{4.05}$− $0.06CaTiO_3$	1380/4h	Composite	15.4	72700		−1	439
961	$Li_3(Mg_{0.95}Zn_{.05})_2NbO_6$	1140/4H	Fdd	15.4	82200	8.9	−19	397
962	$Sm_2Ba(Cu_{0.985}Co_{0.015})O_5$		Orthorhombic Pnma	15.5	59300	10.3	−8	323
963	$SrSmAlO_4$		K_2NiF_4 type tetragonal I4/mmm	15.5	95300		−1	440
964	$0.91MgWO_4$-$0.09CaTiO_3$+5 wt% Li_2CO_3-$4H_3BO_3$	950		15.5	20800		0	441
965	$(Mg_{0.95}Zn_{0.05})_2TiO_4$	1330	Cubic Fd3m	15.5	275300		−34	442
966	$(Mg_{0.9}Mn_{0.1})_2TiO_4$	1330	Cubic Fd3m	15.5	172000		−57	443
967	$SrNd_4Si_3O_{13}$	1400/4h	Hexagonal apatite $P6_3/m$	15.5	21000		−29	253
968	$ZnW_{1-x}Te_xO_4$ (x=0.2)	900	Wolframite Monoclinic $P2_1/n$	15.5	24600		−60	206
969	$0.91MgWO_4$-$0.09CaTiO_3$	950	Composite	15.5	20800	7.1	0	441
970	$SrTe_2O_5$	580		15.5	8700		−116	444
971	$Cu_3Nb_2O_8$	900/2h	Anorthic	15.6	48400		−75	445
972	$(Mg_{0.9}Co_{.0.1})_2TiO_4$	1390/4h	Cubic Fd3m	15.6	162000	10.4	−47	446
973	$(Mg_{0.96}Mn_{0.04})_2TiO_4$	1330	Cubic Fd3m	15.6	237000		−52	443
974	BaO-$0.33MgO$-$0.34WO_3$-$0.33TiO_2$	1500/6h	Perovskite hexagonal	15.6	67000		−10	373
975	$SrPr_4Si_3O_{13}$	1325/4h	Hexagonal apatite $P6_3/m$	15.6	12200		−9	253

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
976	$Mg_2(Ti_{0.95}Sn_{0.05})O_4$	1390	Cubic Fd3m	15.6	318000	10.8	−45	447
977	$Bi_4(SiO_4)_3$+3 mol% B_2O_3		Cubic I-43d	15.6	36300		−22	448
978	$SmNb_{1-x}(Si_{1/2}Mo_{1/2})_xO_4$ (x=0.69)		Tetragonal scheelite $I4_1/a$	15.6	32800		−38	449
979	$Li_3(Mg_{0.95}Ca_{0.05})_2NbO_6$	1140	Fdd	15.6	96200	8.9	−18	397
980	$LiZnNbO_4$	1070	Tetragonal	15.6	85300	9.1	−64	450
981	$(Mg_{0.95}Co_{.0.05})_2TiO_4$	1390/4h	Cubic Fd3m	15.7	286000	10.4	−52	446
982	$(Mg_{0.95}Mn_{0.05})_2TiO_4$	1330	Cubic Fd3m	15.7	276000		−53	443
983	$Mg_{1.8}Ti_{1.1}O_4$	1450/4h	Tetragonal $P4_122$	15.7	141000	10.57	−52	451
984	$YAlO_3$	1650/2h	Perovskite Hexagonal P63/mmc	15.7	58000	10	−59	452
985	$Mg_4Nb_2O_9$+3 wt% LiF+6 wt% $CaTiO_3$	950/5h	Corundum type+mixtures	15.7	22100		−3	453
986	$(1-x)(Al_{1/2}Ta_{1/2})O_2$-$x(Mg_{1/3}Ta_{2/3})O_2$ (x=0.2)	1550	Orthorhombic Pbcn	15.7	103600		−40	454
987	$LaTi_2Al_9O_{19}$	1600	Monoclinic	15.7	68200		−22	455
988	$0.7Ba_2BiV_3O_{11}$-$0.3TiO_2$	910	Composite	15.7	53200	8.57	−2	420
989	$Li_3Bi_2P_3O_{12}$	725	Cubic I-43m	15.8	26600		−130	456
990	Li_3NbO_4	930/2h	Cubic I-43m	15.8	55000		−49	457
991	$Y_2Ba_{0.7}Sr_{0.3}Cu_{0.25}Zn_{0.75}O_5$		Orthorhombic Pnma	15.8	20700	10.5	−13	393
992	Li_2CeO_3	720/4h	Cubic Fm3-m	15.8	143700		−123	458
993	Li_2TiO_3-13 wt% MgO+4 wt% LiF	850/4h		15.8	64500		0	459
994	$SrNdAlO_4$		K_2NiF_4 type Tetragonal I4/mmm	15.9	110000		−15	440
995	$Ca(Ta_{2-x}Nb_x)O_6$ (x=1.5)	1425	Cubic Pm3	15.9	102500		−56	460
996	$YSmBaZnO_5$		Orthorhombic	15.9	63210	9.9	−23	58
997	$Y_2Ba_{0.7}Sr_{0.3}Cu_{0.75}Zn_{0.25}O_5$		Orthorhombic Pnma	15.9	12450		0.8	393
998	$MgCu_2Nb_2O_8$	1010	Not available	15.9	6780		−46	315
999	$Ba_3Ti_5Nb_6O_{28}$+5 wt% B_2O_3	900/2h	Monoclinic $P2_1/c$	15.9	14000		−13	461
1000	$SmNb_{1-x}(Si_{1/2}Mo_{1/2})_xO_4$ (x=0.68)		Monoclinic+Tetragonal	15.9	33400		−39	449
1001	$(0.4Bi_2O_3$-La_2O_3-MgO-$TiO_2)$-$0.6La(Mg_{0.5}Ti_{0.5})O_3$	900	Composite	15.9	14300		35	462
1002	$BaNb_{2-x}Ta_xP_2O_{11}$ (x=1.5)	1250	Rhombohedral R-3c	15.9	13200		−25	392

1003	75 wt% $ZnNb_2O_6$-TiO_2+25 wt% (SiO_2- B_2O_3_Al_2O_3)	875	Composite	15.9	15000		−20	27
1004	Gd_2BaCuO_5		Orthorhombic Pbnm	16.0	3320	11.05	−27	384
1005	$Mn_4Nb_2O_9$	–	Corundum Trigonal P-3c1	16.0	50000		–	329
1006	3CaO-2ZnO-Ta_2O_5-TiO_2	1325	Composite	16.0	34500	6.2	−49	230
1007	$NdYBaZn_{0.45}Cu_{0.55}O_5$	1250/50h	Orthorhombic Pnma	16.0	100270		–	463
1008	$Ba_{10}Ta_{7.04}Sn_{1.2}O_{30}$		Trigonal P-3m1	16.0	30000		20	464
1009	$Co_4Nb_2O_9$	1200	Corundum Trigonal P-3c1	16.0	5000		−10	274
1010	$(Mg_{0.95}Zn_{0.05})TiO_3$	1320/4h	Ilmenite Trigonal R-3	16.0	210000		−60	465
1011	$Y_{1.5}Sm_{0.5}BaZnO_5$		Orthorhombic Pbnm	16.0	120000	−32		466
1012	$Ba_{2-2x}Sr_{2x}SmSbO_6$ (x=0.1)	1500	Perovskite	16.0	93000		−50	467
1013	Sr_2SmSbO_6	1550	Perovskite	16.0	93000		−50	467
1014	(1-y)Li_3NbO_4+yLi_2SnO_3 (y=0.7)		Composite	16.0	75300		3	409
1015	Tm_2BaZnO_5		Orthorhombic Pnma	16.1	8040	9.9	−20	58
1016	$Sm_2Ba(Cu_{0.995}Co_{0.005})O_5$		Orthorhombic Pbn	16.1	87800	10	−8	323
1017	$(Li_{1/2}Nd_{1/2})WO_4$	775/4h	Tetragonal $I4_1/n$	16.1	4210		142	429
1018	$MgTiO_3$	1350/4h	Ilmenite Trigonal R-3	16.1	289400		−54	468
1019	$(Mg_{0.095}Co_{0.05})_{1.8}Ti_{1.1}O_4$	1390/4h	Spinel cubic Fd3m	16.1	207500	10.7	−53	469
1020	0.4$LiFe_5O_8$-0.6$Li_2MgTi_3O_8$	1050/2h	Disordered spinel	16.1	28500		–	470
1021	$Nd_2BaZn_{0.5}Cu_{0.5}O_5$		Orthorhombic Pnma	16.2	36570		−13	468
1022	$Zn_2Te_3O_8$	620	Monoclinic C2/c	16.2	66000	4.9	−60	471
1023	$(Mg_{0.95}Ca_{0.05})TiO_3$+3 mol% V_2O_5	1100	Ilmenite Trigonal R-3	16.2	62000		50	472
1024	Er_2BaZnO_5	1300	Orthorhombic Pnma	16.3	6836	9.9	−28	58
1025	$ErAlO_3$	1650/2h	Perovskite Orthorhombic Pbnm	16.3	44200	10	−40	452
1026	BaO-0.33MgO-0.35WO_3-0.32TiO_2	1500	Perovskite Hexagonal	16.3	77000		−10	373
1027	$Ba_3MgNb_{2-x}Sb_xO_9$ (x=1)		Perovskite	16.3	33400	6.7	−4	381
1028	0.9$(Mg_{0.95}Zn_{0.05})_2(Ti_{0.8}Sn_{0.2})O_4$-0.1 ($Ca_{0.8}Sr_{0.2}$)$TiO_3$+5.3LiF-$Fe_2O_3$-$V_2O_5$	950	Composite	16.3	30800	8.3	−10	473
1029	$(Li_{0.5}Yb_{0.5})MoO_4$	820	Tetragonal Scheelite	16.3	6350		53	474
1030	0.7$Li_3(Mg_{0.92}Zn_{0.08})_2NbO_6-0.3Ba_3(VO_4)_2$	950	Composite	16.3	50000	8.6	2	475

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
1031	Pb_2WO_5	520	Monoclinic	16.4	14800	7.6	−95	476
1032	$Co_4Nb_2O_9$	1100/10H	Corundum type Trigonal P-3c1	16.4	5000		−11	358,477
1033	Li_3NbO_4	1150	Cubic I-43m	16.4	47100	10	−45	478,479
1034	$0.8Li_2Zn_3Ti_4O_{12}$-$0.2Li_2TiO_3$+2 wt% $0.1.5B_2O_3$-0.6CuO	925/5h	Composite	16.4	69000		−42	480
1035	Li_2TiO_3-13 wt% MgO	1325/4h		16.4	87500		−1	459
1036	$(Mg_{1-x}Zn_x)_{1.8}Ti_{1.1}O_4$ (x=0.06)	1360/4h	Cubic Fd3m	16.5	210700		−62	451
1037	$Ca(Ta_{2-x}Nb_x)O_6$ (x=1.4)	1425	Orthorhombic Pbcn	16.5	84080		−49	460
1038	$0.5BaMoO_4$-$0.5TiO_2$	1285	Composite	16.5	25200		46	229
1039	$ZnW_{1-x}Te_xO_4$ (x=0.0)	1100	Wolframite $P2_1/n$	16.5	20500		−70	206
1040	$Y_2Ba_{0.7}Sr_{0.3}Cu_{0.5}Zn_{0.5}O_5$		Orthorhombic Pnma	16.5	17670	10.1	−2	393
1041	$Y_2Ba_{0.7}Sr_{0.3}Cu_{0.15}Zn_{0.85}O_5$		Orthorhombic Pnma	16.5	23640	10.5	−18	393
1042	Sm_2BaCuO_5		Orthorhombic Pnma	16.5	53200	9.9	−5	323
1043	$Mg_3Sm_4Al_{44}O_{75}$	1680	Magnetoplumbite	16.5	11000		95	145
1044	$MgTiO_3$ (slow cooled 1°/min)	1350	Ilmenite Trigonal R-3	16.5	220000		−55	481
1045	$0.84Ba(Mg_{1/2}W_{1/2})O_3$-$0.16BaTiO_3$	1500	Perovskite hexagonal	16.6	12000		−11	373
1046	$CoCu_2Nb_2O_8$	985	Not available	16.6	36800		−37	315
1047	$(Mg_{0.95}Ca_{0.05})TiO_3$+5 mol% V_2O_5	1000	Ilmenite Hexagonal R-3	16.6	13700		−50	472
1048	$ErNbO_4$	1500	Monoclinic fergusonite	16.6	43900		−64	363
1049	$Li_{3-3x}Mg_{4x}Nb_{(1-x)}O_4$ (x=0.2)	1300/2h		16.6	85160	10	−32	479
1050	$SrLaAlO_4$		Tetragonal I4/mmm	16.7	149400		−32	440
1051	$Mg(Ti_{0.95}Sn_{0.05})O_3$		Ilmenite Trigonal R-3	16.7	275000	10.3	−53	447
1052	$Ba(Mg_{1/2}W_{1/2})O_3$	1500/6h	Perovskite cubic Fm3m	16.7	42000		34	373
1053	$0.6Ba(Mg_{1/2}W_{1/2})O_3$-$0.4BaTiO_3$	1500/6h	Perovskite Hexagonal	16.7	15000		12	373
1054	$Y_2Ba_{0.7}Sr_{0.3}ZnO_5$		Orthorhombic Pnma	16.7	4920	10.8	−35	393
1055	$ZnCu_2Nb_2O_8$	900/2h		16.7	41000		−77	482
1056	$Sm_2BaCu_{0.99}Co_{0.01}O_5$		Orthorhombic Pnma	16.8	90700	9.9	−9	58,323
1057	$Y_2Ba_{0.7}Sr_{0.3}Cu_{0.1}Zn_{0.9}O_5$		Orthorhombic Pnma	16.8	23600	10.5	−21	393
1058	70 wt% (La_2O_3-B_2O_3-TiO_2 in 20:60:20 mol%)+30 wt % $BaNd_2Ti_5O_{14}$	800	Composite	16.8	5900	7.1	109	419

1059	$(Mg_{0.95}Co_{0.05})TiO_3$		Ilmenite Trigonal R-3	16.8	230000	10	−54	483
1060	$SmNb_{1-x}(Si_{1/2}Mo_{1/2})_xO_4$ (x=0.04)		Monoclini+Tetragonal	16.8	45300		−45	449
1061	$1\text{-}xCeO_2\text{-}xSm_2O_3$ (x=0.25)	1650	Cubic flurite Fm3m	16.8	29650		−56	413
1062	$Li_{3-3x}Mg_{4x}Nb_{(1-x)}O_4$ (x=1/3)	1300/2h		16.8	79600	10	−22	479
1063	$[Mg_{0.5}Zn_{0.5})_{0.95}Co_{0.05}]_2TiO_4$+8 wt% BCB	925	Composite	16.8	28000		−29	484
1064	$(Na_{0.5}Bi_{0.5})_{0.4}Ca_{0.6}MoO_4$	800	Tetragonal scheelite	16.8	31800		−17	343
1065	$0.36Ba_5Nb_4O_{15}\text{-}0.64BaWO_4$	1100	Composite	16.9	56700		−4	485
1066	$Co_2La_4Ti_3Si_{(4-x)}O_{22-d}$ (x=0)	1275	Perrierite Monoclinic $P2_1/a$	16.9	35100	4.73	−164	486
1067	$(1\text{-}x)CeO_2\text{-}xEu_2O_3$ (x=0.85)	1600	Cubic flurite Fm3m	16.9	64700		−39	413
1068	$Sm_2BaCu_{0.25}Zn_{0.75}O_5$	1300/2h	Orthorhombic Pnma	16.9	42200	−4.6		405
1069	$0.4Li_2Zn_3Ti_4O_{12}\text{-}0.6Ba_3(VO_4)_2$	950	Composite	16.9	51300		3	487
1070	$3CaO\text{-}2ZnO\text{-}Ta_2O_5\text{-}TiO_2$	1400	Mixture	17.0	30000	6.6	−47	230
1071	$CeO_2\text{-}0.5WO_3\text{-}0.5TiO_2$	1130	Mixture	17.0	45500		7	488
1072	$Mg_5Ta_4O_{15}$	1550	Psuedo-brookite Orthorhombic Cmcm	17.0	14400	7.2	−15	325
1073	$BaNb_2O_6$		Columbite Orthorhombic $C222_1$	17.0	2600	7.01		489
1074	$Ba(Mg_{1/2}W_{1/2})O_3$	1550/6h	Perovskite Fm3m	17.0	57000		−34	373,432
1075	$Ca_5Ta_2HfO_{12}$	1700	Perovskite Orthorhombic Pnma	17.0	18000	5.9	−32	490
1076	$MgTiO_3$		Ilmenite Trigonal R-3	17.0	166400		−50	491,492
1077	$Mg_{0.95}Co_{0.05}TiO_3$	1200/3h	Ilmenite Trigonal R-3	17.0	170000	9.4	−40	493
1078	$ErAlO_3$		Perovskite Orthorhombic Pbnm	17.0	44200	10	−40	452
1079	$Bi_2O_3\text{-}4MoO_3$	600	Mixture	17.0	9300		−160	494
1080	Ba_2TeO_5	950	Monoclinic	17.0	49600	12	−124	277
1081	30 vol% Al_2O_3+BaO-ZnO-SrO-CaO-Nd_2O_3-TiO_2-B_2O_3-SiO_2 glass	900	Composite	17.0	800		−2	495
1082	$Nd_2Sn_2O_7$	1550/9h	Cubic	17.0	33100		−55	496
1083	Dy_2BaZnO_5	1320	Orthorhombic	17.1	29669	9.9	−2	58
1084	$CuNb_2O_6$	1000	Columbite Pbcn	17.1	7100	7.4	−45	489
1085	$BaO\text{-}0.34\ MgO\text{-}0.35\ WO_3\text{-}0.31TiO_2$	1500/6h	Perovskite Hexagonal	17.1	75000		−8	373
1086	Eu_2BaCuO_5		Orthorhombic Pbnm	17.1	9820		−25	497

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
1087	$LaSrAlO_4$	1450	Tetragonal K_2NiF_4 type	17.1	30770	10.77	3	435
1088	$(Mg_{0.95}Zn_{0.05})TiO_3$	1300	Ilmenite Trigonal R-3	17.1	264000	7	−40	498
1089	$NdYBaZn_{0.45}Cu_{0.55}O_5$			17.1	100300	−30		463
1090	$Ba(Ni_{1/2}W_{1/2})O_3$	1450	Perovskite Cubic Fm3m	17.1	36300	13.3	−68	432
1091	$SmNb_{1-x}(Si_{1/2}Mo_{1/2})_xO_4$ (x=0.03)		Monoclinic+Tetragonal	17.1	46200		−46	449
1092	In_2O_3-WO_3-TiO_2	1175	Multphase	17.2	5100	6.4	−68	400
1093	Gd_2BaZnO_5	1280	Orthorhombic Pbnm	17.2	2580	9.8	−27	58
1094	$Eu_2BaCu_{0.25}Zn_{0.75}O_5$		Orthorhombic Pbnm	17.2	57920		−29	497
1095	Ho_2BaZnO_5	1300	Orthorhombic Pbnm	17.2	6200	9.8	−23	58
1096	$Li_3(Mg_{0.92}Zn_{0.08})2NbO_6$	1120/4h	Orthorhombic Fddd	17.2	142300		−23	416
1097	$CaNb_2O_6$	1350	Columbite Pbcn	17.3	49600	6.9	−53	489
1098	$Mg_3Eu_4Al_{44}O_{75}$	1680	Magnetoplumbite	17.3	11000		147	145
1099	Li_2MgTiO_4	1360	Rock salt	17.3	97300	9.8	−27	499
1100	1-xCeO_2-xTm_2O_3 (x=0.25)	1650	Cubic flurite Fm3m	17.3	27850		−40	413
1101	$Co_2La_4Ti_3Si_{(4-x)}O_{22-d}$ (x=0.05)	1300	Perrierite Monoclinic $P2_1/a$	17.3	46600	4.75	−177	486
1102	$MgTiO_3$ (Pecchini mehod)+0.1 mol% Cr	1150	Ilmenite Trigonal R-3	17.3	136400			500
1103	$CoZnTiO_4$	1200	Cubic Spinel Fd-3m	17.3	97600	8.8	−36	501
1104	$Co_2La_4Ti_3Si_{(4-x)}O_{22-d}$ (x=0.1)	1300	Perrierite monoclinic $P2_1/a$	17.4	48700	4.68	−155	486
1105	$Mg(Sn_{0.05}Ti_{0.95})O_3$	1390/4h	Trigonal Ilmenite R-3H	17.4	322000		−54	502
1106	$Ba_8Zn(Nb_{6-x}Sb_x)O_{24}$ (x=2.4)	1425	Not available	17.4	9800		−3	503
1107	$LuNbO_4$	1500	Monoclinic fergusonite I2	17.4	56600		−64	363
1108	$Ba(Mg_{0.33}Ta_{0.13}Ti_{0.267}W_{0.267})O_3$	1560	Perovskite Hexagonal P-3m1	17.4	43780	7.1	−29	438
1109	$CaTeO_3$	840		17.4	49300	10		223
1110	$MgTi_2O_5$	1500/3h	Orthorhombic Psuedobrookite Bbmm	17.4	47000		−66	418
1111	$MgTiO_3$ (Chemical Pecchini mehod)	1150	Ilmenite, trigonal R-3H	17.4	166400		–	500
1112	0.5$Li_2Zn_3Ti_4O_{12}$-0.5$Ba_3(VO_4)_2$	950	Composite	17.4	56500		−5	487
1113	0.6$Li_2Zn_3Ti_4O_{12}$-0.4$Ba_3(VO_4)_2$	975	Compposite	17.5	73100		−16	487
1114	$BaTe_4O_9$	500	Monoclinic	17.5	54700		−90	277,504
1115	0.96$MgTiO_3$-0.036$SrTiO_3$+4 wt% CuO	1070/2h	Composite	17.5	25100		0	505

1116	$0.74CaWO_4$-$0.26TiO_2$	1250	Composite	17.5	27000		0	506
1117	$(Zn_{1-x}Cu_x)_2TiO_4$ (x=0.005)	1060/4h	Cubic Fd3m	17.5	7300		–	507
1118	$0.95MgTiO_3$-$0.05CaTiO_3$+5 wt% B_2O_3	1050	Composite	17.5	22000		−2	508
1119	$0.8Li_2Zn_3Ti_4O_{12}$-$0.2Li_2TiO_3$+2 wt% $0.4B_2O_3$-$0.6CuO$	925/5h	Composite	17.5	71000		−44	480
1120	$Mg(Zr_{0.05}Ti_{0.95})O_3$+1 wt% B_2O_3	1270	Ilmenite Cubic R-3	17.6	108000		2	509
1121	$DyAlO_3$	1650/2h	Perovskite Orthorhombic Pnma	17.6	38000	10	−34	452
1122	Nd_2BaCuO_5		Tetragonal I4/mcm	17.6	2200		−18	463
1123	$ZnWO_4$	1100	Monoclinic P2/c	17.6	65000		−60	150
1124	Ba_aMgWO_6		Perovskite Cubic Fm3m	17.6	45200	10.1		432
1125	$Co_2La_4Ti_3Si_{(4-x)}O_{22-d}$ (x=0.02)	1275	Perrierite Monoclinic $P2_1/a$	17.6	40800	4.73	−174	486
1126	MWF-38+10 wt% Li_2O-B_2O_3-SiO_2-CaO-Al_2O_3 (28:27:30:5:10)	875	Composite	17.7	3700		−15	510
1127	$MgTiO_3$+1 mol% Nb_2O_5	1350	Ilmenite R-3H, Trigonal	17.7	175000		–	511
1128	$0.95MgTiO_3$-$0.05CaTiO_3$+15 wt% LMZBS	1050	composite	17.7	29000		−10	508
1129	$Ca(Nb_{0.93}Ta_{0.07})_2O_6$	14004h	Othrorhombic columbite Pbcn	17.7	117000		−51	512
1130	$Mg_{0.97}Zn_{0.03}TiO_3$+0.5 mol% Zn	1275	Ilmenite	17.7	277500	8.5	−55	513
1131	Li_2ZrO_3+1 wt% BaO-CuO	900	Monoclinic C2/c	17.8	4300		12	390
1132	$0.94Mg_2TiO_4$-$0.6SrTiO_3$	1440/4h	Composite	17.8	70900	10	−3	514
1133	$Co_2La_4Ti_3Si_{(4-x)}O_{22-d}$ (x=0.25)	1250	Perrierite Monoclinic $P2_1/a$	17.8	30700	4.7	−150	486
1134	CeO_2-WO_3-TiO_2	1025	Multiphase	17.8	13100	6.2	85	400
1135	$DyNbO_4$	1250	Monoclinic fergusonite I2	17.8	38500		−66	363
1136	$(Zr_{0.8}Sn_{0.2})TiO_4$+10 wt% BaO-B_2O_3-SiO_2-Li_2O-CuO	950/4h	Composite	17.8	12700		1	515
1137	$NiTiO_3$	1475/4h	Trigonal R-3 Ilmenite	17.8	13900		−51	516
1138	$0.96MgTiO_3$-$0.036SrTiO_3$	1170/2h	Composite	17.9	30400	9	5	505
1139	$Eu_2BaCu_{0.5}Zn_{0.5}O_5$		Orthorhombic Pnma	17.9	49849		−30	497
1140	$(Zn_{1-x}Cu_x)_2TiO_4$ (x=0.01)	1060/4h	Cubic Fd3m	17.9	7500			517
1141	$MgTiO_3/CaTiO_3$ layered		Layered-composite	17.9	61400	9.64	0	518

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
1142	$Ba[Ti_{1-x}(Co_{0.5}W_{0.5})_xO_3$ (x=0.61)		Perovskite	18.0	7700		−14	519
1143	$0.94(Mg_{0.95}Zn_{0.05})_2TiO_4$-$0.06SrTiO_3$	1270	Cubic spinel	18.0	125600	10	0	520
1144	$(Zn_{0.95}Cu_{0.05})_2TiO_4$	1060	Cubic Fd3m	18.0	9700	7.4	−166	517
1145	$0.91Mg_2(Ti_{0.95}Sn_{0.05})O_4$-$0.09CaTiO_3$		Composite	18.0	92000		0	521
1146	$2/3LaCa_{0.5}Zr_{0.5}O_3$-$1/3CaTiO_3$	1575	Composite	18.0	26000	5.3	−75	522
1147	$5MgO$-Ta_2O_5-TiO_2	1325	Mixture	18.0	114000	6.61	−56	230
1148	$Zn_{0.6}Mg_{0.4}TiO_3$+5 wt% B_2O_3-SiO_2-ZnO-K_2O	1100	Composite	18.0	29400		–	523
1149	$Sm_2BaCu_{0.5}Zn_{0.5}O_5$		Orthorhombic Pbnm	18.0	65700	−6.4		524
1150	$(1-x)LaCa_{0.5}Zr_{0.5}O_3$-$xCaTiO_3$ (x=1/3)		Composite	18.0	16000		−75	522
1151	$0.5CeO_2$-$0.5Sm_2O_3$	1650	Composite	18.0	90000		−30	525
1152	$5ZnO$-Nb_2O_5-TiO_2	1050	Mixture	18.0	6000	5.9	−57	230
1153	$5MgO$-Ta_2O_5-TiO_2	1325	Mixture	18.0	114000	6.6	−47	230
1154	CeO_2-$0.5NiO$-$0.5TiO_2$	1200	Mixture	18.0	25300		−58	488
1155	$0.8Li_2Zn_3Ti_4O_{12}$-$0.2Li_2TiO_3$	1160	Cubic $P4_232$	18.0	100000		−48	480
1156	$Ca_9Nd_2W_4O_{24}$	1450	Tetragonal scheelite 141/a	18.0	4050			526
1157	Eu_2BaZnO_5		Orthorhombic Pnma	18.1	23360		−25	497
1158	$0.7Li_2Zn_3Ti_4O_{12}$-$0.3Ba_3(VO_4)_2$	1000	Composite	18.1	88980		−25	487
1159	$MgTiO_3/CaTiO_3$ /$MgTiO_3$ layered		Layered-composite	18.1	61400	9.6	0	518
1160	$MgTiO_3$+6 wt% CuO-Bi_2O_3-V_2O_5	900/2h	Ilmenite Trigonal R-3	18.1	20300		−57	527
1161	$Nd_2BaZn_{0.25}Cu_{0.75}O_5$	1250/10h	Tetragonal I4/mcm	18.1	25170		−18	463
1162	BaO-$0.32MgO$-$0.28WO_3$-$0.4TiO_2$	1500/6h	Composite	18.1	48000		−3	407
1163	$Ba(Ni_{1/2}W_{1/2})O_3$	1450	Perovskite cubic Fm3m	18.1	52000	8.22	−45	528
1164	$0.92(Mg_{0.95}Co_{0.05})_2TiO_4$-$0.08(Ca_{0.8}Sr_{0.2})TiO_3$+0.5 wt% B_2O_3	1200/4h	Composite	18.1	95000	9.5	−5	529
1165	$0.91(Mg_{0.97}Co_{0.03})2(Ti_{0.95}Sn_{0.05})O_4$-$0.09CaTiO_3$	1390/4h	Composite	18.1	87600		4	530
1166	$Sr_{1-x}Ca_xLaAlO_4$ (x=0.4)	1475	Tetragonal I4/mmm	18.1	150500		−26	531
1167	$Mg(Zr_{0.05}Ti_{0.95})O_3$	1420	Ilmenite Trigonal R-3	18.1	380000		−50	532
1168	$0.85Li_2TiO_3$-$0.5Li_2WO_4$	950	Mixture	18.1	81000		2	533

1169	$CaNb_2O_6$	1400/4h	Orthorhombic columbite Pbcn	18.1	50000		−54	534
1170	$(Zn_{1-x}Cu_x)_2TiO_4$ (x=0.05)	1060/4h	Cubic Fd3m	18.2	7500		−82	507
1171	$Mg(Zr_{0.05}Ti_{0.95})O_3$+1.5 wt% CuO	1300	Ilmenite Trigonal R-3	18.2	223000		−2	535
1172	$(Zn_{0.95}Mn_{0.05})_2TiO_4$	1180	Cubic Fd3m	18.2	9550	7.5	−200	517
1173	$Mg_{1+\delta}TiO_{3+\delta}$ (δ=0.03)	1400	Ilmenite Trigonal R-3	18.2	326600		−50	536
1174	$CaSmAlO_4$		K_2NiF_4 type Tetragonal I4/mmm	18.2	51060		−3	537
1175	$CaNdAlO_4$		K_2NiF_4 type Tetragonal I4/mmm	18.2	17980		−52	537
1176	$0.9(Mg_{0.95}Zn_{0.05})_2(Ti_{0.8}Sn_{0.2})O_4$-$0.1(Ca_{0.8}Sr_{0.2})TiO_3$	950	Spinel+Perovskite Composite	18.2	49100	8.1	15	473
1177	$SrLa_2Al_2O_7$		Tetragonal R-P phase	18.2	71700		−22	538
1178	$Zn(Mn_{1-x}Ti_x)3O_7$ (x=0.68)+5 wt% ZnO-B_2O_3	900	Multiphase	18.2	12000		−4	539
1179	$0.6LiMgVO_4$-$0.4TiO_2$	740	Composite	18.2	21600		−11	140
1180	$BiCuVO_6$	675	Monoclinic $P2_1/n$	18.2	7800	7.7	−177	540
1181	0.995MgO-0.005BaO-TiO_2	1320	Cubic Fm3m	18.3	18500	9.83		541
1182	$Mg_3Gd_4Al_{44}O_{75}$	1680	Magnetoplumbite	18.3	4800		175	145
1183	$Mg_3Tb_4Al_{44}O_{75}$	1680	Magnetoplumbite	18.3	5900		200	145
1184	$0.5ZnNb_2O_6$-$0.5Zn_3Nb_2O_8$-12 wt% $ZnCuB_2O_5$	875	Orthorhombic mixture	18.3	39750	5.9	−88	542
1185	$Sr(Ni_{1/2}W_{1/2})O_3$	1570	Perovskite Cubic Fm3m	18.3	56000	8.4	−50	528
1186	(1-x)CeO_2-xNd_2O_3 (x=0.7)	1600	Cubic flurite Fm3m	18.3	44700		−62	413
1187	$Mg_{1+\delta}T\ iO_{3+\delta}$ (δ=0.02)	1400	Ilmenite Hexagonal R-3	18.3	357600		−50	536
1188	$0.93(Mg_{0.95}Zn_{0.05})_{1.8}Ti_{1.1}O_4$-$0.07CaTiO_3$	1375	Composite	18.3	96000		−5	543
1189	$0.93(Mg_{0.97}Zn_{0.03})(Ti_{0.95}Sn_{0.05})O_4$-$0.07CaTiO_3$	1390/4h	Cubic spinel	18.3	94700		−4	426
1190	$0.91Mg_2TiO_4$-$0.1(Ca_{0.8}Sr_{0.2})TiO_3$	1300/4h	Composite	18.3	90500	9.5	0	544
1191	$0.8MgNb_2O_6$-$0.2CaTiO_3$	1300	Composite	18.4		73700	−45	545
1192	$GdAlO_3$	1650/2h	Perovskite Orthorhombic	18.4	11000	10	−54	452
1193	$(Zr_{0.8}Sn_{0.2})TiO_4$+10 wt% BaO-B_2O_3-SiO_2-Li_2O-CuO	950/8h	Composite	18.4	10500		−0	515
1194	$BaNd_2Ti_5O_{14}$+La_2O_3-B_2O_3-TiO_2	750	Composite	18.4	6100		4	546

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
1195	$0.93(Mg_{0.95}Co_{0.05})TiO_4$-$0.07SrTiO_3$		Composite	18.4	102200	9.5	1	547
1196	$0.88Mg_2TiO_4$-$0.12CaTiO_3$+4 wt% $ZnNb_2O_6$	1360/6h	Composite	18.4	31000	6	0	548
1197	Sm_2BaZnO_5		Orthorhombic Pnma	18.5	35500	9.5	−6	549
1198	$Sr_{1+x}La_{1-x}Al_{1-x}Ti_xO_4$	1500		18.5	95000		−9	550
1199	(1-x)CeO_2-xSm_2O_3 (x=0.85)	1600	Cubic flurite Fm3m	18.5	44700		−55	413
1200	$(Zn_{1-x}Cu_x)_2TiO_4$ (x=0.2)	1060/4h	Cubic Fd3m	18.5	7400		−15	507
1201	$(Mg_{0.7}Zn_{0.03})_{0.95}Co_{0.05}TiO_3$+7 wt% $BaCu(B_2O_5)$	950/4h	Composite	18.5	35000		−51	551
1202	$Mg_{0.95}Zn_{0.05}Ti_2O_5$	1450/4h	Orthorhombic Bbmn	18.5	45000		−41	552
1203	$0.2Li_2Zn_3Ti_4O_{12}$-$0.8Li_2TiO_3$+3 wt% $0.4B_2O_3$-0.6CuO	925/5h	Cubic composite	18.5	42000		−38	480
1204	$Li_2Zn_3Ti_4O_{12}$+2 wt% BCB	900	Cubic Fd-3m	18.5	31100		−36	553
1205	$Mg_{0.95}Co_{0.05}Ti_2O_5$	1425/4h	Orthorhombic Bbmn	18.6	68000		−39	552
1206	$(Li_{0.5}Er_{0.5})MoO_4$	800	Tetragonal Scheelite	18.6	10650		186	474
1207	$(Ca_{1+x}Sm_{1-x})(Al_{1-x}Ti_x)O_4$ (x=0.02)	1450	K_2NiF_4 type Tetragonal I4/mmm	18.6	74600		−11	454
1208	$Co_2La_4Ti_3Si_{(4-x)}O_{22-d}$ (x=0.5)	1250	Perrierite monoclinic $P2_1/a$	18.6	20700	4.6	−131	486
1209	$0.77(0.5ZnAl_2O_4$-$0.5TiO_2)$-$0.23MgTiO_3$	1390/4h	Composite	18.7	190000		−2	406
1210	$DyTiNb_xTa_{1-x}O_6$ (x=0.05)	1575	Orthorhombic Pbcn	18.7	31000	5.7	−28	555
1211	$0.96MgTiO_3$-$0.036SrTiO_3$+4.5 Wt% CuO	1070/2h	Ilmenite Trigonal R-3	18.7	19600	9		505
1212	(1-x)$(Mg_{0.95}Ni_{0.05})TiO_3$-x$SrTiO_3$ (x=0.01)	1300/4h	Composite	18.7	105000		−38	556
1213	$Nd_2BaZn_{045}Cu_{0.55}O_5$	1250/10h	Tetragonal+Orthrohombic	18.8	44100		−20	463
1214	$SmNbO_4$	1250	Orthorhombic Ima2	18.8	56300		−40	363
1215	$CaNb_2O_6$	1350	Orthorhombic Pbcn	18.8	49600		−53	557
1216	$[(Mg_{0.5}Zn_{0.5})_{0.95}Co_{0.05}]_2TiO_4$	1225	Cubic spinel Fd3m	18.8	206000		−21	558
1217	$0.9MgTiO_3$-$0.1CaTiO_3$+5 wt% Li_2O-B_2O_3-SiO_2	950	Composite	18.8	19000		10	559
1218	$Mg_{0.95}Ni_{0.05}Ti_2O_5$	1425/4h	Orthorhombic bbmn	18.8	50000		−48	552
1219	$(Li_{0.5}Y_{0.5})MoO_4$	780	Tetragonal Scheelite	18.8	10400		193	474

1220	(1-x)$Li_3Bi_2P_3O_{12}$-xTiO_2 (x=0.45)	750	Monoclinic $P2_1/m$	18.9	13700		−43	456
1221	$CaYAlO_4$	1450/3h	K_2NiF_4 type Tetragonal I4/mmm	18.9	39980		6	537
1222	$Sr_{1-x}Ca_xNdAlO_4$ (x=0.6)	1450/3h	K_2NiF_4 structure	18.9	91300		−13	560
1223	$Sr_{0.6}Ca_{0.4}LaAlO_4$+0.15 wt% B_2O_3	1300	K_2NiF_4 structure	18.9	63000		−25	561
1224	$(Ca_{1+x}Sm_{1-x})(Al_{1-x}Ti_x)O_4$ (x=0)	1400	K_2NiF_4 type Tetragonal I4/mmm	19.0	54600		−15	554
1225	Sr_2AlNbO_6 (oxygen atm)	1550	Perovskite	19.0	16000	8.3	−5	562
1226	$YTiNbO_6$	1400	Aschenite Orthorhombic Pbcn	19.0	8820	8.2	−45	563
1227	$Sm_{0.1}Y_{0.9}TiNbO_6$	1420	Aschenite Orthorhombic Pbcn	19.0	11700		−42	564
1228	$Zn_{0.6}Mg_{0.4}TiO_3$+5 wt% B-Si-Zn-K glass	950	Trigonal R-3	19.0	18950			565
1229	$ZnTiO_3$	1100	Trigonal R-3	19.0	30000	10	−55	566
1230	0.96$MgTiO_3$-0.036$SrTiO_3$+2 Wt% B_2O_3	1170/2h	Composite	19.0	75300	9	−9	505
1231	$Bi_2Mo_3O_{12}$	610	Monoclinic $P2_1/n$	19.0	21800	7.6	−215	494
1232	$(Zn_{0.95}Co_{0.05})_2TiO_4$	1180	Cubic spinel Fd3m	19.0	2100	7.3		517
1233	$Ba_{2-2x}Sr_{2x}SmSbO_6$ (x=0.4)	1500	Perovskite	19.0	30000		−40	467
1234	$Ba(Zn_{1/2}W_{1/2})O_3$	1250/4h	Cubic perovskite Fm3m	19.0	14000		−35	567
1235	$Ca_{1-3x/2}La_x(Mg_{1/2}W_{1/2})O_3$ (x=0.02)	1375/2h	Complex perovskite Monoclinic	19.0	55000	–	−75	568
1236	0.4$Li_2Zn_3Ti_4O_{12}$-0.6Li_2TiO_3+3 wt% 0.4B_2O_3-0.6CuO	900/5h	Composite	19.0	29000		−38	480
1237	$(Nd_{0.99}Co_{0.015})_{1.02}Nb_{0.988}O_4$	1250/4h	Monoclinic fergusonite I2/a	19.0	43300		−48	569
1238	$Ca_9Sm_2W_4O_{24}$	1450	Tetragonal scheelite 141/a	19.0	3100			526
1239	$(Ba_xMg_{1-x})(Sn_{0.0}5Ti_{0.95})O_3$ (x=0.01)	1210/4h	Ilmenite type Trigonal	19.0	120000		−42	570
1240	0.75$ZnWO_4$-0.25TiO_2+0.5 wt% Li_2CO_3-H_3BO_3	950/2h	Composite	19.0	13500		−11	571
1241	$(Nd_{0.99}Mn_{0.015})_{1.02}Nb_{0.988}O_4$	1250/4h	Monoclinic fergusonite I2/a	19.1	38600		−43	569
1242	$(Nd_{0.99}Ca_{0.015})_{1.02}Nb_{0.988}O_4$	1250/4h	Monoclinic fergusonite I2/a	19.1	35300		−38	569
1243	(1-x)$MgTiO_3$-x$Ca_{0.8}Sr_{0.2}TiO_3$ (x=0.02)		Composite	19.1	110600		−38	572
1244	$Tb(Ti_{1/2}W_{1/2})O_4$	1375	Tetragonal Scheelite	19.1	5900	6.6	−6	400
1245	0.99MgO-0.01BaO-TiO_2	1320	Composite	19.1	21500	9.53		541
1246	80 wt% $ZnNb_2O_{6-}TiO_2$+20 wt% (SiO_2- $B_2O_{3\_}Al_2O_3$)	875	Composite	19.1	9600		9	27
1247	0.25Li_5FeO_8-0.75$Li_2ZnTi_3O_8$	1050	Composite	19.1	11770	6.84	−60	573

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
1248	$Nd(Mg_{0.47}Ba_{0.03}Sn_{0.5})O_3$	1600/4h	Cubic perovskite	19.1	97500		−64	574
1249	$Li_2Zn_3Ti_4O_{12}$+1.5 wt% Li_2O-ZnO-B_2O_3 glass	900/2h	Cubic $P4_232$	19.1	63800	9	−49	575
1250	Pb_2MoO_5	610/2h	Monoclinic	19.1	21960	7.46	−60	576
1251	$(Na_{0.5}Bi_{0.5})_{0.5}Ca_{0.5}MoO_4$	775	Tetragonal scheelite	19.1	22700		−10	343
1252	$(Ba_xMg_{1-x})(Zr_{0.05}Ti_{0.95})O_3$ (x=0.01)	1210/4h	Ilmenite type Trigonal	19.1	180000		−38	570
1253	$(Ba_xMg_{1-x})(Zr_{0.05}Ti_{0.95})O_3$ (x=0.03)	1210/4h	Ilmenite type Trigonal	19.2	156000		−35	570
1254	85 wt% $ZnNb_2O_6$-TiO_2+15 wt% (CaO- B_2O_3-SiO_2)	875	Composite	19.2	11000		17	27
1255	CaO-Sm_2O_3-Al_2O_3	1425	Composite	19.2	120000		−10	577
1256	0.76Li_2TiO_3-0.24MgO	1250	Rocksalt Monoclinic C2c	19.2	106220		4	578
1257	1-xCeO_2-xLa_2O_3 (x=0.25)	1650	Cubic flurite Fm3m	19.2	14700		−64	413
1258	$(Mg_{0.95}Co_{0.05})_2TiO_4-0.08(Ca_{0.8}Sr_{0.2})TiO_3$		Composite	19.2	123200	9.2	3	579
1259	$Nd(Mg_{0.45}Co_{0.05}Sn_{0.5})O_3$	1550	Perovskite	19.2	68900		−67	580
1260	$Bi(Sb_{1-x}Ta_x)O_4$ (x=0.05)	960	Monoclinic I2/c	19.2	60,000		−55	581
1261	$Li_{2.081}Ti_{0.676}Nb_{0.243}O_3$+5 wt% LBS glass	850	Composite	19.2	41400		−2	582
1262	$YbTiTaO_6$	1560	Euxenite Orthorhombic Pbcn	19.3	31800	6.2	−41	583
1263	$CaTe_2O_5$	780	Monoclinic	19.3	13400	10		223
1264	$BiSbO_4$	1080/2h	Monoclinic I2/c	19.3	70000		−62	584
1265	$Nd(Mg_{0.5}Sn_{0.5})O_3$	1550/4h	Perovskite	19.3	43300		−57	585
1266	$MgTi_2O_5$+10 wt% LBS glass	950/2h	Composite	19.3	6800	–	−16	167
1267	$Ba(Co_{1/2}W_{1/2})O_3$	1390	Perovskite Cubic Fm3m	19.3	21000	7.76	−55	528
1268	TeO_2	640/15h	Tetragonal $P4_12_12$	19.3	30000	4	−119	586
1269	$Zn_2Te_3O_8$+4 wt% TiO_2	650/2h	Monoclinic C2/c	19.3	27000	5.14	−9	471
1270	$LaNbO_4$	1250	Fergusonite Monoclinic I2/a	19.3	54400		9	363
1271	$Y(Ti_{1/2}W_{1/2})O_4$	1425	Tetragonal Scheelite	19.3	6200		−19	400
1272	0.4$Li_2Zn_3Ti_4O_{12}$-0.6Li_2TiO_3	1240	Composite	19.3	28000		−31	480
1273	$Nd_{2.9/3}Ca_{0.05}(Mg_{0.5}Sn_{0.5})O_3$	1550/4h	Cubic	19.3	99000		−65	587
1274	$(Ba_{0.05}Mg_{0.95})(Zr_{0.05}Ti_{0.95})O_3$	1210/4h	Ilmenite type	19.3	132000		−32	570
1275	$LiNi_{0.5}Ti_{0.5}O_2$	1275/6h	Fm-3m	19.3	51300		−20	588

1276	$La(Mg_{0.5}Sn_{0.5})O_3$+2 wt% ZBS glass	1400/4h	Cubic	19.4	35800		−86	589
1277	$(Ca_{1+x}Sm_{1-x})(Al_{1-x}Ti_x)O_4$ (x=0.06)	1500	K_2NiF_4 type Tetragonal I4/mmm	19.4	120700		−9	554
1278	$(Nd_{0.99}Sr_{0.015})_{1.02}Nb_{0.988}O_4$	1250/4h	Monoclinic fergusonite I2/a	19.4	33100		−30	569
1279	$Li_2Zn_3Ti_4O_{12}$+1.5 wt% BCB	900	Cubic Fd-3m	19.4	57600		−40	553
1280	$0.94CaNb_2O_6$-$0.06CaTiO_3$	1300	Composite	19.5	69500		−65	545
1281	$Ca(La_{1/2}Ta_{1/2})O_3$	1500	Perovskite Monoclinic $P2_1/n$	19.5	30000	9.8	−41	590
1282	$CoTiO_3$	1375/5h	Trigonal R-3 Ilmenite	19.5	62500		−49	516
1283	Sm_2BaZnO_5	1320/2h	Orthorhombic Pmna	19.5	35500	−6.4		405
1284	$ZnTiO_3$+0.25 wt% V_2O_5	900	Trigonal R-3	19.5	2700	7.4		591
1285	90 wt% $ZnNb_2O_6$-TiO_2+10 wt% (SiO_2- B_2O_3-Al_2O_3)	900	Composite	19.5	9200		18	27
1286	90 wt% (Mg,Ca)TiO_3+10 wt% Li_2O-B_2O_3-SiO_2	950	Composite	19.5	26700		−12	592
1287	$Ca_{1+x}Nd_{1-x}Al_{1-x}O_4$ (x=0.15)		Tetragonal I4/mmm	19.5	93400		−2	593
1288	$Nd(Mg_{0.4}Zn_{0.1}Sn_{0.5})O_3$	1500/4h	Perovskite	19.5	129200		−66	594
1289	$(Zn_{0.95}Ni_{0.05})_2TiO_4$	1180	Cubic Fd3m	19.5	2200	7.3		517
1290	$LaNbO_4$+3 wt% CuO	950/2h	Monoclinic fergusonite I2/a	19.5	49000		1	595
1291	$Li_{2+x}Ti_{1-4x}Nb_{3x}O_3$ (x=0.07)	1300	Monoclinic rock salt	19.5	84800		−1	596
1292	$SrLaAlO_4$ (co-precipitation PH=8)	1425	Tetragonal I4/mmm	19.5	56500		−33	597
1293	$Nd(Mg_{0.43}Ca_{0.07}Sn_{0.5})O_3$	1550/4h	Perovskite	19.5	100400			598
1294	$(Li_{0.5}Gd_{0.5})MoO_4$	750	Tetragonal Scheelite	19.5	3900		209	474
1295	PbO:B_2O_3:SiO_2 (70:20:10) glass		Glass	19.6	500	10.3	−155	92
1296	$NdNbO_4$	1250	Monoclinic fergusonite I2/a	19.6	33000		−24	363
1297	Sm_2BaCuO_5		Orthorhombic Pnma	19.6	3400	11.36	−9	384
1298	$(Ca_{1+x}Sm_{1-x})(Al_{1-x}Ti_x)O_4$ (x=0.1)	1500	K_2NiF_4 type Tetragonal I4/mmm	19.6	113700		−6	554
1299	$(Mg_{0.95}Ca_{.05})TiO_3$+5 mol% B_2O_3	1200	IlmeniteTrigonal R-3	19.6	86000	10	−3	472
1300	$0.92Ba(Mg_{1/2}W_{1/2})O_3$-$0.08BaTiO_3$	1500/6h	Perovskite Cubic Fm3m	19.6	37000		−19	373
1301	$Nd_{0.5}La_{1.5}BaZnO_5$			19.6	16320		−1	599
1302	$CaNb_2O_6$	1400	Columbite Pbcn	19.6	21500		13	600
1303	$Ca(Sm_{1/2}Ta_{1/2})O_3$	1500	Perovskite	19.6	26500	9.8	−24	590
1304	$CaTe_2O_5$			19.6	12600		−89	444

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
1305	$LiYbW_2O_8$	900	Monoclinic P2/n	19.7	8720		45	48
1306	$Ba(Mg_{0.33}Ta_{0.33}Ti_{0.167}W_{0.167})O_3$	1580	Perovskite Trigonal R-3	19.7	58200	6.5	−11	438
1307	$(1\text{-}y)Li_3NbO_{4\text{-}y}Li_2TiO_3$ (y=0.6)		Composite	19.7	91200		24	409
1308	$La(Mg_{0.5}Sn_{0.5})O_3$+0.5 wt% B_2O_3	1500/4h	Perovskite	19.7	45000		−85	601
1309	Li_2TiO_3+1 wt% BaO-CuO	900	Monoclinic C2/c	19.7	46300		31	390
1310	$La_4Ti_3O_{12}$		Hexagonal	19.7	9950		−10	602
1311	$(Ba_xMg_{1\text{-}x})(Zr_{0.05}Ti_{0.95})O_3$ (x=0.07)	1210/4h	Ilmennite type Trigonal	19.7	100000		−31	570
1312	Li_2TiO_3	1230	Monoclinic C2/c	19.8	23600		39	390
1313	$Zn_2Te_3O_8$+30 wt% $TiTe_3O_8$	600	Composite	19.8	50000		3	603
1314	$(1\text{-}y)Li_3NbO_4$-+yLi_2TiO_3 (y=0.6)		Composite	19.8	91200		−24	409
1315	$Ca_{1.15}Sm_{0.85}Al_{0.85}Ti_{0.15}O_4$+0.15 wt% B_2O_3	1325	Tetragonal I4/mmm	19.8	89400		−1	604
1316	$Dy(Ti_{1/2}W_{1/2})O_4$	1425	Tetragonal Scheelite	19.9	6000	6.6	−5	400
1317	$MgNb_2O_6$+2 wt% CuO	1170	Columbite Orthorhombic Pbcn	19.9	110000	10	−44	605
1318	$BaNd_2Ti_5O_{14}$: $(20La_2O_3\text{-}60B_2O_3\text{-}20TiO_2)$ (60:40 wt%)	850	Tungsten bronze	19.9	8200			606
1319	$1\text{-}xCeO_2\text{-}xNd_2O_3$ (x=0.4)	1650	Cubic flurite Fm3m	19.9	34100		−55	413
1320	$Ba_8Zn(Nb_{6\text{-}x}Sb_x)O_{24}$ (x=1.8)	1425		19.9	18600		6	503
1321	$La_{0.97}Sm_{0.03}(Mg_{0.5}Sn_{0.5})O_3$	1500/4h		19.9	70200		−77	607
1322	$(Li_{0.5}Sm_{0.5})MoO_4$	640	Tetragonal Scheelite	19.9	4600		231	474
1323	$(Sr_{1\text{-}x}Ca_x)La_2Al_2O_7$ (x=0.1)	1600/3h	R-P I4/mmm	19.9	135400		−19	608
1324	$Ca(Al_{1/2}Ta_{1/2})O_3$		Complex perovskite	20.0	8500	–	−90	609
1325	$Ca[(Li_{1/3}Nb_{2/3})_{0.95}Ti_{0.05}]O_{3\text{-}d}$+5 wt% Bi_2O_3	900/3h	Perovskite	20.0	6500		−4	610
1326	$La_{0.9}Nd_{0.1}NbO_4$	1250	Monoclinic fergusonite I2/a	20.0	45000		−1	363
1327	$Ca(Nd_{1/2}Ta_{1/2})O_3$	1500	Perovskite Monoclinic $P2_1/n$	20.0	2400	9.7	−16	590
1328	$0.95MgTiO_3\text{-}0.05CaTiO_3$+0.25 wt% CuO	1275/4h	Composite	20.0	51000	7	−8	611
1329	$Ca(Nd_{1/2}Nb_{1/2})O_3$	1500	Complex perovskite	20.0	17500	9.6	−33	590

1330	$GdTiNbO_6$	1385	Aschenite Orthorhombic Pbcn	20.0	9050	7.27	−52	563
1331	$MgO\text{-}SiO_2\text{-}TiO_2$+15 wt% $ZnO\text{-}B_2O_3$+2.4 wt% Co_2O_3	1160	Composite	20.0	100000	10		612
1332	$Sm_{0.3}Y_{0.7}TiNbO_6$	1420	Orthorhombic Pbnm	20.0	19200		−33	564
1333	$LaNbO_4$		Monoclinic I2/a	20.0	15000		50	279
1334	$Li_{2.081}Ti_{0.676}Nb_{0.243}O_3$	1100	Monoclinic	20.0	50000		13	613
1335	$CaO\text{-}4ZnO\text{-}Nb_2O_5\text{-}TiO_2$	1125	Composite	20.0	9000	5.9	−47	230
1336	$5NiO\text{-}Nb_2O_5\text{-}TiO_2$	1125	Composite	20.0	8200	5.9	−64	230
1337	$CaO\text{-}4MgO\text{-}Ta_2O_5\text{-}TiO_2$	1360	Composite	20.0	50000	5.6	−33	230
1338	$5NiO\text{-}Ta_2O_5\text{-}TiO_2$	1300	Composite	20.0	14000	5.9	−53	230
1339	$Sr_3Zn_{0.75}Mg_{0.25}Nb_2O_9$	1300	Hexagonal, perovskite	20.0	8500		−16	614
1340	$CaO\text{-}4Co_3O_4\text{-}Ta_2O_5\text{-}TiO_2$	1210	Composite	20.0	26000	5.8	−30	230
1341	$Ba_{1-3x/2}La_x(Mg_{1/2}W_{1/2})O_3$ (x=0.02)	1450/2h	Complex perovskite cubic Fm3m	20.0	87680	–	−1	568
1342	$xBa(Mg_{1/2}W_{1/2})O_3\text{-}(1\text{-}x)BaTiO_3$ (x=0.92)	1500/6h	Perovskite Fm3m	20.0	37000		−19	373
1343	$0.95MgTiO_3\text{-}0.05CaTiO_3$	1400	Ilmenite Trigonal R-3	20.0	56000		0	615
1344	$0.94MgTiO_3\text{-}0.06CaTiO_3$+0.25 wt% CuO	1275	Ilmenite Trigonal R-3	20.0	48000		−3	611
1345	$0.75MgAl_2O_4\text{-}0.25TiO_2$		Composite	20.0	10500		0	195
1346	$Ba(Mg_{1/3}Ta_{(2\text{-}2x)/3}W_{x/3}Ti_{x/3})O_3$ (x=0.15)	1550/4h	Perovskite Trigonal R-3	20.0	90000		0	438
1347	$Ba[Ti_{1-x}(Ni_{1/2}W_{1/2})_x]O_3$ (x=0.6)	1425	Perovskite Hexagonal $P6_3/mmc$	20.0	42000		−10	616
1348	$Zn_3Nb_2O_8$+2 wt% V_2O_5+0.5 wt% CuO	800	Monoclinic C2/c	20.0	36000	11.8	–	617
1349	$BiSbO_4+V_2O_5\text{-}CuO$	930	Monoclinic I2/c	20.0	40000		−75	618
1350	$La_{2.98/3}Sr_{0.01}(Mg_{0.5}Sn_{0.5})O_3$	1550/4h		20.0	57100		−77	619
1351	$Ba(Mg_{1/2}W_{1/2})O_3$	1550/2h	Perovskite Cubic Fm3m	20.0	120000		−28	620
1352	$Ba(Zn_{0.49}W_{0.5})O_{2.995}$	1360/4h	Perovskite Cubic Fm3m	20.0	40000		−35	567
1353	$Zn_{1.8}Ti_{1.1}O_4$	1090	Cubic Fd3m	20.0	20200		−58	451
1354	$La_{2.98/3}Ba_{0.01}(Mg_{0.5}Sn_{0.5})O_3$+0.25 wt% CuO	1500/4h		20.0	50000		−78	621
1355	$0.5Mg_4Nb_2O_9\text{-}0.5CaTiO_3$+1.7 wt% V_2O_5	1150/5h	Composite	20.0	48000		−12	622
1356	$(Co_{0.95}Zn_{0.05})TiO_3$	1350/3h	Trigonal R-3	20.0	107000	9.27	60	623

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
1357	$La_{2.98/3}Ba_{0.01}(Mg_{0.5}Sn_{0.5})O_3$+0.25 wt% CuO	1500/4h	Not available	20.0	50100		−78	621
1358	$0.95MgTiO_3$-$0.05CaTiO_3$+1 wt% ZnO	1300	Composite composite	20.0	65000	7	−6	624
1359	$Ba(Mg_{1/2}W_{1/2})O_3$+x$Ba(Y_{1/3}W_{1/3})O_3$+ (x=0.02)	1575	Cubic Fm-3m Perovskite	20.0	160000		−21	625
1360	$ZnNb_2O_6$-$0.2CaTiO_3$+4 wt% $BaCu(B_2O_5)$	950/4h	Composite	20.0	12500		3	626
1361	$0.95MgTiO_3$-$0.05CaTiO_3$+1 wt% ZnO+0.5 wt% WO_3	1310		20.0	62000	7	−5	627
1362	$La(MgSn)_{0.5}O_3$	1600/4h	Perovskite Monoclinic $P2_1/n$	20.1	63000		−78	628
1363	$La(Mg_{0.43}Ba_{0.07}Sn_{0.5})O_3$	1550/2h	Cubic perovskite	20.1	51600	−82	−8	629
1364	$(Ba_xMg_{1-x})(Sn_{0.05}Ti_{0.95})O_3$ (x=0.03)	1210/4h	Ilmenite type Trigonal	20.1	100000		−26	570
1365	$0.96Mg_{0.95}Co_{0.05}TiO_3$-$0.04SrTiO_3$+1 wt% ZnO	1250	Composite	20.1	74000		−8	630
1366	$NdNbO_4$+2 wt% CaF_2	1225	Monoclinic fergusonite I2/a	20.1	75000		−19	631
1367	(1-x)$(Mg_{0.95}Ni_{0.05})TiO_3$-x$SrTiO_3$ (x=0.03)	1300/4h	Composite	20.1	85000		−11	556
1368	$SrNb_2O_6$	1300	Columbite Monoclinic $P2_1/c$	20.1	16900	6.5	–	489
1369	$0.55LiMgVO_4$-$0.45TiO_2$	760	Composite	20.1	20100		16	140
1370	Zn_2TiO_4	1300/2h	Cubic Fd3m	20.2	19000		−55	632
1371	$(Ca_{1+x}Sm_{1-x})(Al_{1-x}Ti_x)O_4$ (x=0.15)	1400	K_2NiF_4 type Tetragonal I4/mmm	20.2	97800		−0.5	554
1372	$Ba_3NiNb_{2-x}Sb_xO_9$ (x=0.5)		Cubic Pm3m	20.2	16780	6	−29	381
1373	$La_{1-x}Bi_x(Mg_{0.5}Sn_{0.5})O_3$ (x=0.1)			20.2	58100		−84	633
1374	$La(Mg_{0.4}Ca_{0.1}Sn_{0.5})O_3$	1500	Perovskite	20.2	80500		−79	634
1375	$La(Mg_{0.4}Ni_{0.1}Sn_{0.5})O_3$	1550/4h		20.2	74600		−85	635
1376	$La_{0.97}Yb_{0.03}(Mg_{0.5}Sn_{0.5})O_3$			20.2	56800		−79	636
1377	$MgLi_{2/3}Ti_{4/3}O_4$	1125/2h	Cubic Fd-3m	20.2	62300		−27	637
1378	(1-x)$MgTiO_3$-x$Ca_{0.8}Sr_{0.2}TiO_3$ (x=0.04)		Ilmenite Hexagonal R-3	20.2	97200		−21	572
1379	$0.2Li_2Zn_3Ti_4O_{12}$-$0.8Li_2TiO_3$	1240	Composite	20.2	24000		−11	480
1380	$(Ba_xMg_{1-x})(Sn_{0.05}Ti_{0.95})O_3$ (x=0.05)	1210/4h	Ilmenite type Trigonal	20.2	84000		−17	570
1381	$(Ba_xMg_{1-x})(Sn_{0.05}Ti_{0.95})O_3$ (x=0.07)	1210/4h	Ilmenite type Trigonal	20.3	75000		−14	570

1382	$SrLaGaO_4$	1275/3h	Tetragonal I4/mmm	20.3	16200		−34	638
1383	La_2BaZnO_5		Tetragonal I4/mcm	20.3	17800		−0.9	599,639
1384	$NdLaBaZnO_5$		Orthorhombic	20.3	7900		−5	599
1385	$ZnTiO_3$+0.5 wt% V_2O_5	900	Hexagonal R-3	20.3	5200	7.8		591
1386	90 wt% $ZnNb_2O_6$-TiO_2+10 wt% (Li_2O- B_2O_3-SiO_2)	875	Composite	20.3	8200		5	27
1387	$0.95(Mg_{.95}Co_{.05})TiO_3-0.05CaTiO_3$	1275/4h	Ilmenite Hexagonal R-3	20.3	107000	7	−23	422
1388	CeO_2.(at 30K)	1675	Cubic flurite Fm3m	20.3	600000	5.5		640
1389	$Pr(Ti_{1/2}W_{1/2})O_4$	1300	Tetragonal Scheelite	20.3	6900	6.53	−20	400
1390	$MnTa_2O_6$	1350	Columbite Orthorhombic Pbcn	20.3	16500		−44	600
1391	$(Li_{0.5}Nd_{0.5})MoO_4$	660	Tetragonal Scheelite	20.3	3000		235	474
1392	(1-x)$Mg_{0.95}Ni_{0.05}Ti_{0.98}Zr_{0.02}O_3$-x$SrTiO_3$ (x=0.04)		Composite	20.3	85400		3	641
1393	$SmAlO_3$	1650/2h	Orthorhombic Pbnm	20.4	65000	10	−74	452
1394	$MnTiO_3$	1350/2h	Hexagonal R-3(148) Ilmenite	20.4	15200		−56	516
1395	$Ba_3NiNb_{2-x}Sb_xO_9$ (x=1)		Hxagonal $P6_3mc$	20.4	43880	6.3	−18	381
1396	$CoNb_2O_6$	1300/4h	Columbite Pbcn	20.5	81000		−70	489,642
1397	$(Ba_xMg_{1-x})(Sn_{0.05}Ti_{0.95})O_3$ (x=0.1)	1210/4h	Ilmenite type Trigonal	20.5	37000		−3	570
1398	$Li_2Ti_{1-x}(Zn_{1/3}Nb_{2/3})_xO_3$ (x=0.2)		Monoclinic C2/c	20.5	75300		15	643
1399	$Sm_{0.4}Y_{0.6}TiNbO_6$	1400		20.5	15000		−30	564
1400	$Co_{1+0.01}Nb_2O_6$ (sintered in O_2)	1400	Columbite Pbcn	20.5	114000		−60	644
1401	$Sr_2La_2MgW_2O_{12}$	1525	Trigonal R-3m	20.5	35000		−83	645
1402	$SrNd_2Al_2O_7$		Tetragonal R-P phase	20.5	65500		−4	538
1403	$(Ba_{0.1}Mg_{0.9})(Zr_{0.05}Ti_{0.95})O_3$	1210/4h	Ilmenite type	20.6	25000		−28	570
1404	$ZnLi_{2/3}Ti_{4/3}O_4$	1075	Cubic Fd-3m	20.6	106700		−48	553
1405	0.5CeO_2-0.5$BaTi_4O_9$+12 wt% B_2O_3+1 wt% CuO	950/4h	Cubic flurite Fm3m+Orthorhombic Pnmm	20.6	17000	5.7	48	646
1406	$ErTiTaO_6$	1560	Euxenite orthorhombic	20.6	85500		−29	583
1407	$(Li_{0.5}Ce_{0.5})MoO_4$	580	Tetragonal Scheelite	20.6	2000		228	474
1408	$Ca(La_{1/2}Nb_{1/2})O_3$	1500	Perovskite	20.6	38000	9.4	−51	590

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
1409	$MgTiO_3$+5 mol% Bi_2O_3-7 mol% V_2O_5	875	Ilmnite Trigonal R-3+second phase	20.6	10420	6.3		647
1410	0.97MgO-0.03BaO-TiO_2	1320	Mixture phases	20.6	32600	9.35		541
1411	$(Ba_xMg_{1-x})(Zr_{0.05}Ti_{0.95})O_3$ (x=0.1)	1210/4h	Ilmneite type Trigonal	20.6	25000		−28	570
1412	$ZnTiO_3$+0.75 wt% V_2O_5	900	Trigonal R-3	20.6	8800	8.2		591
1413	$(Ba_{0.75}Sr_{0.25})(Mg_{0.5}W_{0.5})O_3$	1400	multiphase	20.6	152600		24	648
1414	$Nd_2BaZn_{0.8}Cu_{0.2}O_5$		Tetragonal I4/mcm	20.7	11680		−2	463
1415	$Sr_3ZnNb_2O_9$	1300	Complex perovskite Cubic Pm3m	20.7	7500		−27	614
1416	$LaAlO_3$+0.25 wt% CuO	1460	Perovskite Trigonal R-3m	20.7	48000		−80	649
1417	$(Ca_{1+x}Sm_{1-x})(Al_{1-x}Ti_x)O_4$ (x=0.2)	1500	K_2NiF_4 type Tetragonal I4/mmm	20.7	99400		1	554
1418	$CeAlO_3$	1500	Tetragonal P4/mmm	20.7	40110	9.5	−57	650
1419	$Ba_4Ti_3P_2O_{15}$	1200/4h	Monoclinic	20.7	42200		37	651
1420	Ba_2SmSbO_6	1500	Perovskite Cubic Fm3m	20.7	86500		25	467
1421	$Sr_{1-3x/2}La_x(Mg_{1/2}W_{1/2})O_3$ (x=0.01)	1550/2h	Complex perovskite Tetragonal	20.7	60000	–	−40	568
1422	Li_2TiO_3+2 wt% Li_2O-ZnO-B_2O_3+35 wt% $LiZnNbO_4$	900	Composite	20.7	19300		0	652
1423	$(Zn_{0.95}Ni_{0.05})_3Nb_2O_8$+4 wt% B_2O_3-CuO	930/2h	Monoclinic	20.7	98000		−85	653
1424	$Ba_2Mg_{0.9}Ca_{0.1}WO_6$	1500	Perovskite Cubic Fm3m	20.8	120700		0	441
1425	TeO_2		Tetragonal $P4_12_12$	20.8	34700		−101	444
1426	0.964$MgTiO_3$-0.036$SrTiO_3$	1270	Ilmenite Trigonal R-3+Perovskite	20.8	71000		−1	654
1427	$La_{2-x/3}Na_x(Mg_{1/2}W_{1/2})O_3$ (x=0.5)	1450	Perovskite Orthorhombic I222	20.8	5700		−47	655
1428	$Nd_2BaZn_{0.7}Cu_{0.3}O_5$		Tetragonal I4/mcm	20.8	19793		−3	463
1429	0.96$Mg(Zr_{0.05}Ti_{0.95})O_3-0.04SrTiO_3$		Composite	20.8	257000		0	656
1430	$(Zn_{0.95}Co_{0.05})Nb_2O_8$+4 wt% B_2O_3-CuO	930	Composite	20.8	105000		−84	657
1431	0.94$(Mg_{0.95}Co_{0.05})TiO_3-0.06CaTiO_3$	1275/4h	Composite	20.9	102000	7	−10	422
1432	$Ca(Sm_{1/2}Nb_{1/2})O_3$	1500	Perovskite	20.9	24500	9.4	−28	590
1433	0.95MgO-0.05BaO-TiO_2	1320	Composite	20.9	32500	9.06		541
1434	0.96$MgTiO_3$-0.04$SrTiO_3$	1300/4h	Composite	20.9	135000	9	0	658
1435	$Zn_{1.01}Nb_2O_6$	1300/4h	Columbite Pbcn	20.9	120000		−74	642

1436	$MnNb_2O_6$	1150	Columbite Pbcn	20.9	12900	6.8	−74	557
1437	$Li_{2.081}Ti_{0.676}Nb_{0.243}O_3$+1.5 wt% B_2O_3	880	Monoclinic	20.9	34100		8	613
1438	$0.95Mg(Zr_{0.05}Ti_{0.95})O_3$-$0.05SrTiO_3$	1390	Composite	20.9	203000	6.8	2	659
1439	$CoLi_{2/3}Ti_{4/3}O_4$+1.5 wt% $BaCu(B_2O_5)$	900	Cubic spinel Fd-3m	20.9	27800		−24	660
1440	$(1-x)Li_3Bi_2P_3O_{12}$-$xTiO_2$ (x=0.50)	750	Monoclinic $P2_1/m$	20.9	14000		−25	456
1441	$Li_2ZnTi_3O_8$-0.2 SnO_2	1080/4h	Cubic spinel	10.9	89500		−24	661
1442	$(1-x)(Mg_{0.95}Ni_{0.05})TiO_3$-$xSrTiO_3$ (x=0.04)	1300/4h	Composite	20.1	73000		1	556
1443	$Mg_{1.03}Nb_2O_6$	1400/4h	Columbite Pcan	21.0	121000		−60	642
1444	$0.964MgTiO_3$-$0.036SrTiO_3$	1270	Composite	21.0	71000		−1	654
1445	$BaTe_2O_6$	650	Orthorhombic Cmcm	21.0	50300		−51	277
1446	$Ca(Mg_{1/3}Ta_{2/3})O_3$		Complex perovskite	21.0	78000	–	−61	609
1447	$Zn_3Nb_2O_8$	1150/2h	Monoclinic C2/c	21.0	83300		−71	445,632
1448	$0.95MgTiO_3$-$0.05CaTiO_3$	1450	Composite	21.0	56000	7	0	611
1449	$5NiO$-Nb_2O_5-TiO_2	1125	Mixture	21.0	8200	5.08	−64	230
1450	$TbTiNbO_6$	1385	Aschenite Orthorhombic Pbcn	21.0	15700	7.58	−45	563
1451	$5ZnO$-$2Nb_2O_5$	1220	Mixed phases	21.0	88000	6.98	−73	325
1452	$Sm_{0.6}Y_{0.4}TiNbO_6$	1400	Euxenite Orthorhombic Pbnm	21.0	11500		−4	564
1453	$Ca_5Ta_2ZrO_{12}$	1700	Perovskite	21.0	23800	5.38	−27	662
1454	$ZnTiO_3$	925	Trigonal R-3	21.0	30000		−90	663
1455	$Ca[(Li_{0.33}Nb_{0.67})_{0.9}Ti_{0.1}]\ O_{3-\delta}$+20 wt% LiF	840	Composite	21.0	20400		−18	664
1456	$Ba_{0.95}(Zn_{1/2}W_{1/2})O_{2.95}$	1250/4h	Cubic perovskite Fm3m	21.0	25000		−40	567
1457	$NiNb_2O_6$	1200	Columbite Pbcn	21.0	19300	6.5	−71	557
1458	$Mg_{0.95}Ca_{0.05}TiO_3$+0.2 mol% Bi_2O_3	1250	Ilmenite Trigonal R-3	21.0	55600	7	−12	665
1459	$0.96(Mg_{0.95}Ni_{0.05})TiO_3$-$0.04SrTiO_3$	1300/4h	Ilmenite Trigonal R-3	21.0	73000		1	666
1460	$SrLa_4Si_3O_{13}$+8 wt% TiO_2	1225/4h	Composite	21.0	13000		−10	253
1461	$0.54BaWO_4$-$0.46Ba_5Nb_4O_{15}$	1100	Composite	21.0	49500		9	485
1462	$Mg_{1+0.01}Nb_2O_6$	1400	Columbite Pcan	21.0	121000	10	−60	644
1463	$0.6Mg_4Nb_2O_9$-$0.4SrTiO_3$	1300/4h	Composite	21.0	112000	9.7	2	667
1464	$x(Mg_{0.96}Co_{0.04})TiO_3$-$(1-x)SrTiO_3$ (x=0.94)	1360/6h	Composite	21.0	97000		2	668

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
1465	$Nd(Mg_{0.5}Sn_{0.4}Ti_{0.1})O_3$	1550/4h	Perovskite	21.1	50000		−60	669
1466	$(Sr_{1-x}Ca_x)Nd_2Al_2O_7$ (x=0.5)		Ruddlesden-Popper solid solution	21.1	68200		0	670
1467	$0.4BaTa_2V_2O_{11}$-$0.6Ba_2BiV_3O_{11}$	885	Composite	21.1	44750		2	670b
1468	$Ba[Ti_{1-x}(Zn_{1/2}W_{1/2})_x]O_3$ (x=0.6)	1420	Hexagonal $P6_3/mmc$ perovskite	21.2	26800		−3	695
1469	$Mg_{0.95}Ca_{0.05}TiO_3$+2 wt% B_2O_3	1200	Ilmenite Trigonal R-3	21.2	62000	8	4	615
1470	(1-x)$MgTiO_3$-x$Ca_{0.8}Sr_{0.2}TiO_3$ (x=0.06)	1300/4h	Composite	21.2	110900	9.3	−1	696
1471	$Ca(Yb_{1/2}Ta_{1/2})O_3$	1500	Perovskite	21.2	24000	9.6	−38	590
1472	$SmZrTaO_6$	1650		21.2	24190		−58	671
1473	$CaTa_2O_6$	1600	Cubic Pm3m	21.2	11600		1	600
1474	$Sr(Co_{1/2}W_{1/2})O_3$	1450	Perovskite Cubic Fm3m	21.2	14000	7.72	−73	528
1475	$Li_2Zn(Ti_{0.9}Sn_{0.1})_3O_8$+1.5 wt% $0.4B_2O_3$-0.6CuO	875	Cubic spinel	21.2	12000		−20	672
1476	$Ca_{1-3x}Bi_{2x}A_x)MoO_4$ (x=0.15, A=A site vacancy)	700	Tetragonal Scheelite	21.2	29300		−1	673
1477	$Ca[Li_{0.33}Nb_{0.67}]_{0.9}Ti_{0.1}]O_{3-\delta}$+20 wt% LiF	840	Perovskite	21.3	20450	4.59	−18	664
1478	$ZnTiO_3$+1 wt% V_2O_5	900	Trigonal R-3	21.3	8000	8.8		591
1479	$Nd(Ti_{1/2}W_{1/2})O_4$	1285	Tetragonal Scheelite $I4_1/a$	21.3	10600	5.5	−22	400
1480	$0.98CeO_2$-$0.02CaTiO_3$+0.25 wt% B_2O_3	1380/4h	Fluorite Cubic Fm3m	21.3	60000	8	−41	674
1481	$0.34BaMoO_4$-$0.66TiO_2$	1300	Composite	21.3	20700		119	229
1482	(1-x)$MgTiO_3$-x$Ca_{0.8}Sr_{0.2}TiO_3$ (x=0.06)		Ilmenite Trigonal R-3	21.4	83700		−2	572
1483	$PbWO_4$	620	Tetragonal	21.4	43000	7	−7	476
1484	$CaHfO_3$	1750/6h	Orthorhombic perovskite Pnma	21.4	15950	8.9	−33	675
1485	Li_2TiO_3+5 wt% Li_2O-MgO-B_2O_3	850	Monoclinic C2/c	21.4	64100		27	676
1486	$(Rb,Bi)_{1/2}MoO_4$	550	Scheelite Monoclinic $P2_1/c$	21.4	6200	7.5	−30	677
1487	$CoLi_{2/3}Ti_{4/3}O_4$	1050	Cubic spinel Fd-3m	21.4	35000		−22	660
1488	$0.5CeO_2$-$0.25MgO$-$0.25TiO_2$: 1 WO_3	1400	Mixture phases	21.4	90000	5.57	−50	488
1489	$SrNdGaO_4$	1300/3h	Tetragonal I4/mmm	21.4	16600		7.1	638
1490	$0.9ZnNb_2O_6$-$0.1(ZnO$-$V_2O_5)$	950	Columbite Pbcn	21.4	29500			678
1491	$MgNb_2O_6$	1300	Columbite Orthorhombic Pcan	21.4	93800		−70	600

1492	$MgTiO_3$-$CaTiO_3$ (MMT-20)	1360	Composite	21.4	26000	7		177
1493	$0.5BaCaV_2O_7$-$0.5TiO_2$	950	Composite	21.4	14600		4	679
1494	$0.95(Mg_{0.98}Zn_{0.02})TiO_3$-$0.05CaTiO_3$+4 wt% CBS glass	1240/2h	Composite	21.4	59200		−2	680
1495	$Sm(Ti_{1/2}W_{1/2})O_4$	1300	Tetragonal Scheelite	21.5	7100	5.5	−14	400
1496	BaO-0.32MgO-0.26WO_3-0.42TiO_2	1500/6h	Composite	21.5	49000		1	407
1497	$MgNb_2O_6$+0.25 wt% B_2O_3	1260/3h	Columbite Orthorhombic Pcan	21.5	115800		−48	681
1498	$5Li_2O$-$0.583Nb_2O_5$-$3.248TiO_2$+1 wt% V_2O_5	920	M phase	21.5	32950		6.1	682
1499	85 wt% $Ba_5Nb_4O_{15}$+15 wt% Li_2O-B_2O_3-SiO_2-CaO-Al_2O_3	875	Composite	21.5	3400		−15	592
1500	$NdAlO_3$+0.25 wt% V_2O_5	1410	Perovskite Trigonal R-3m	21.5	64000	9	−30	683
1501	$ZnNb_2O_6$	1200	Columbite Orthorhombic Pbcn	21.5	84500	6.3	−75	557
1502	$Ba_3MgSb_2O_9$		Perovskite Hexagonal $P6_3/mmc$	21.5	23020	5.1	−6	381
1503	$MgNb_2O_6$+2 wt% CuO-B_2O_3	1050	Columbite Orthorhombic Pcan	21.5	108000		−44	684
1504	$Zn_3Nb_2O_8$	1150/2h	Monoclinic C2/c	21.6	83300		−71	632
1505	$PbWO_4$	850	Scheelite Tetragonal $I4_1/a$	21.6	34500		−22	49
1506	$0.93(Mg_{0.95}Co_{0.05})TiO_3$-$0.07CaTiO_3$	1275/4h	Ilmnite Trigonal R-3	21.6	92000	7	−2	685
1507	$Ba[Ti_{1-x}(Ni_{1/2}W_{1/2})_x]O_3$ (x=0.55)	1425	Perovskite	21.6	38400		−8	616
1508	$0.93(Mg_{0.95}Co_{0.05})TiO_3$-$0.07Ca_{0.8}Sr_{0.2}TiO_3$	1275	Composite	21.6	98900		1	686
1509	$SrSm_2Al_2O_7$		Tetragonal R-P phase	21.6	64700		4	538
1510	$(Zn_{0.7}Mg_{0.3})TiO_3$+1 wt% Li_2O-B_2O_3-SiO_2-CaO-Al_2O_3- glass	900	Mixture	21.6	62000		−60	687
1511	$0.93Li_2Mg_2W_2O_9$-$0.07CaTiO_3$	920	Trigonal P-3c1 Corundum	21.6	20700		−1	688
1512	$Mg_{0.95}Ca_{0.05}TiO_3$+0.5 mol%Bi_2O_3	1250	Ilmenite Trigonal R-3	21.7	52400	7	−29	665
1513	$1\text{-}x(Mg_{0.95}Ni_{0.05})TiO_3$-$x(Ca_{0.8}Sr_{0.2})TiO_3$	1275/4h	Composite	21.7	94000		5	689
1514	$1\text{-}xCeO_2$-xEr_2O_3 (x=0.15)	1650	Cubic Flurite Fm3m	21.7	23000		−40	413
1515	$SrNb_2O_6$	1300	Columbite Monoclinic $P2_1/c$	21.7	16900	6.51	–	557
1516	$(1\text{-}x)CeO_2$-xEr_2O_3 (x=0.7)	1650	Cubic flurite Fm3m	21.7	23000		−40	413

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
1517	CeO_2+1 wt% CuO	1580	Cubic flurite Fm3m	21.7	50000	9	−59	690
1518	$0.9Mg_{0.95}Co_{0.05}TiO_3$-$0.1Ca_{0.6}La_{0.8/3}TiO_3$+ 0.25 wt% V_2O_5	1250	Composite	21.7	58000	2.0	−10	691
1519	MgO-TiO_2-ZnO-CaO+10 wt% Li_2O_3-B_2O_3-SiO_2	900	Composite	21.7	50000		−22	692
1520	$MgTiO_3$–$(K_{0.5}La_{0.5})TiO_3$+0.5 wt% ZnO	1300/4h	Multiphase	21.7	68000	8	1	693
1521	$0.56Ba(Mg_{1/2}W_{1/2})O_3-0.44BaTiO_3$	1500	Composite	21.8	13000		44	373
1522	$0.9(Mg_{0.95}Co_{0.05})TiO_3$-$0.1Ca_{0.6}La_{0.8/3}TiO_3$	1350/4h	Composite	21.8	131000	7	−16	694
1523	$(Ca_{1+x}Sm_{1-x})(Al_{1-x}Ti_x)O_4$ (x=0.3)	1500	K_2NiF_4 type Tetragonal I4/mmm	21.8	83100		10	554
1524	99 wt% $BiSbO_4$+1 wt% $CaTiO_3$	1100	Monoclinic I2/c	21.8	61150		−40	697
1525	$0.94MgTiO_3$-$0.06Ca_{0.8}Sr_{0.2}TiO_3$	1300	Composite	21.9	128000		−68	698
1526	$Mg_{0.95}Ca_{0.05}TiO_3$+1 mol% Bi_2O_3	1250	Ilmenite Trigonal R-3	21.9	41100	7	0	665
1527	90 wt% $CaZrO_3$+10 wt% Li_2O-B_2O_3-SiO_2	875	Composite	21.9	4700		−39	592
1528	Li_3NbO_4-0.15$CaTiO_3$		Composite	21.9	24900		−58	699
1529	$(Na_{0.5}Bi_{0.5})_{0.6}Ca_{0.4}MoO_4$	750	Tetragonal scheelite	21.9	20660		8	343
1530	$Ca(Ca_{1/3}Ta_{2/3})O_3$		Perovskite	22.0	22000	–	6	609
1531	$Li_{2.081}Ti_{0.676}Nb_{0.243}O_3$+0.5 wt% B_2O_3	880	M phase	22.0	32000		−41	700
1532	$Sr(Ca_{1/3}Ta_{2/3})O_3$		Complex perovskite Trigonal P-3m1	22.0	27300	7	10	701
1533	$Ca(Ni_{1/3}Ta_{2/3})O_3$		Complex perovskite	22.0	21000	–	−91	609
1534	$CrNbO_4$	1300/5h	Tetragonal $P4_2/mmm$	22.0	4000	4	−80	53
1535	$(Zn_{0.7}Mg_{0.3})TiO_3$	950	Trigonal R-3	22.0	65000		−80	663
1536	$Sr(Mg_{1/3}Ta_{2/3})O_3$		Complex perovskite Hexagonal	22.0	5600	7	−50	701
1537	$Y(Mg_{1/2}Ti_{1/2})O_3$	1650/2h	Perovskite Cubic Fd3m	22.0	33700	10	−46	702
1538	$NdGaO_3$		Perovskite Orthorhombic Pbnm	22.0	85000			703
1539	Sr_4AlNbO_8	1525		22.0	3700	10.25		562

1540	$(Zn_{0.3}Co_{0.7})TiO_3$	1150	Trigonal R-3	22.0	80000		−60	704
1541	$DyTiNbO_6$	1385	Aschenite Orthorhombic Pbcn	22.0	19100	7.76	−42	563
1542	$YbTiNbO_6$	1400	Aschenite Orthorhombic Pbcn	22.0	11000	7.4	−63	563
1543	$Sm_{0.71}Y_{0.29}TiNbO_6$	1400	Orthorhombic Pbnm	22.0	1400		−2	564
1544	$Ca_5Nb_2HfO_{12}$	1700	Perovskite	22.0	16000	5.4	−29	490
1545	$0.5CeO_2$-$0.25ZnO$-$0.25TiO_2$:4 Co_3O_4	1250	Mixed phases	22.0	32100	5.5	−48	490
1546	CeO_2-$0.5CoO$-$0.5TiO_2$	1200	Mixed phases	22.0	50000		−47	488
1547	$CoNb_2O_6$	1150	Columbite Orthorhombic Pbcn	22.0	41700	6.7	−66	489,600
1548	$Zn_{0.5}Mg_{0.5}Nb_2O_6$	1150	Columbite Pbcn	22.0	33100		−29	705
1549	$Ca_{1-x}Bi_xW_{1-x}VxO_4$ (x=0.3)	950/2h	Tetragonal Scheelite ($I4_1/a$)	22.0	16700		2	706
1550	$(1-x)(Mg_{0.95}Zn_{0.05})TiO_3$-$xCa_{0.6}La_{0.8/3}TiO_3$ (x=0.1)	1320/4h	Composite	22.0	94000		−20	465
1551	$5Li_2O$-$0.58Nb_2O_5$-$3.23TiO_2$+0.5 wt% B_2O_3	900	M phase	22.0	32000		10	707
1552	$(1-x)(Mg_{0.95}Ni_{0.05})TiO_3$-$xCa_{0.6}La_{0.8/3}TiO_3$ (x=0.1)	1325	Composite	22.0	118000		−25	708
1553	Li_2TiO_3		Monoclinic rocksalt C2/c	22.0	63500		20	709
1554	Li_2TiO_3+20 vol% $Li_2Zn_3Ti_4O_{12}$	900	Composite	22.0	28400		−2	710
1555	$NdAlO_3$		Perovskite Trigonal R-3m	22.0	58000		−35	711
1556	$ZnNb_2O_6$+10 wt% V_2O_5	900/2h	Columbite Orthorhombic Pnca	22.1	10300		−83	712,713
1557	$La_{2-x/3}Na_x(Mg_{1/2}W_{1/2})O_3$ (x=0.4)	1450	Perovskite Composite	22.1	5500		−45	655
1558	$YTiTaO_6$	1625	Euxenite Orthorhombic	22.1	51400		−20	583
1559	$0.6(Al_{1/2}Ta_{1/2})O_2$-$0.4(Mg_{1/2}Ta_{2/3})O_2$	1450	Orthorhombic Pbcn	22.1	90930		−16	214
1560	$0.92(Mg_{0.95}Co_{0.05})TiO_3$-$0.08CaTiO_3$	1275/4h	Composite	22.1	86400	7	5.4	422
1561	Nd_2BaCuO_5		Tetragonal I4/mcm	22.1	4910		4.6	463
1562	$Nd_2Ba(Zn_{1-x}Cu_x)O_5$ (x=0.15)		Tetragonal I4/mcm	22.1	7700	2		463
1563	$ZnNb_2O_6$+5 wt% CuO	925/2h	Columbite Orthorhombic Pbcn	22.1	59500		−65	482
1564	$Ba(Yb_{1/2}Ta_{1/2})O_3$	1700	Perovskite Cubic Fm3m	22.1	14000	6.7	89	590
1565	$Sm_2Ba_{0.95}Sr_{0.05}ZnO_5$		Orthorhombic	22.1	10000		30	549
1566	Li_2TiO_3		Monoclinic rocksalt C2/c	22.1	63500		20	714

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
1567	$Bi[Sb_{1-x}(Nb_{0.992}V_{0.008})_x]O_4$ (x=0.05)		Monoclinic I2/c	22.1	41000		−54	715
1568	$Ca_{1-x}Bi_xW_{1-x}V_xO_4$ (x=0.3)	950/2h		22.1	16700		2	706
1569	$(1-x)Li_3Bi_2P_3O_{12}$-$xTiO_2$ (x=0.55)	725	Monocklinic $P2_1/m$	22.1	14900		−3	456
1570	$La_3Ti_5Al_{15}O_{37}$	1420	Monoclinic Cc	22.1	57100		19	455
1571	$(1-x)(Mg(Sn_{0.05}Ti_{9.5})O_3$-$x(Ca_{0.8}Sr_{0.2})TiO_3$-ywt% $ZnNb_2O_6$ (x=0.7, y=4)	1320/2h	Composite	22.1	60600	7	0	716
1572	$0.95MgTiO_3$–$0.05(Ca_{0.8}Sr_{0.2})(Zr_{0.1}Ti_{0.9})O_3$	1300/4h	Composite		116000		5	717
1573	$ZnTiO_3$+5 wt% B_2O_3-SiO_2	850	Composite	22.2	52460	6		718
1574	$Mg_{0.93}Ca_{0.07}TiO_3$	1350/3h	IlmeniteTrigonal R-3	22.2	68550		6	719
1575	$Gd(Ti_{1/2}W_{1/2})O_4$	1375	Tetragonal Scheelite	22.2	5000	5.5	−16	400
1576	$Mg_{0.95}Ca_{0.05}TiO_3$+5 mol%Bi_2O_3	1250	Ilmenite Trigonal R-3	22.3	22500	7	−110	665
1577	$NdAlO_3$	1650/2h	Perovskite Trigonal R-3m	22.3	58000	10	−33	452
1578	$Sr_3Zn_{0.5}Mg_{0.5}Nb_2O_9$	1300	Trigonal, complex perovskite P-3m1	22.3	8200		4	614
1579	$Nd_2BaZn_{095}Cu_{0.05}O_5$	1250/10h	Tetragonal I4/mcm	22.4	6340		2	463
1580	$NdAlO_3$+0.25 wt% CuO	1420/2h	Trigonal R-3m	22.4	63000	10	−35	720
1581	$MnNb_2O_6$	1150	Columbite orthorhombic Pbcn	22.4	34300		−60	600
1582	$0.5CeO_2$-$0.25MgO$-$0.25TiO_2$	1400	Mixture phases	22.4	17500	5.5	−62	488
1583	$Zn_3Nb_2O_8$+2 mol% V_2O_5	850-1000	Monoclinic C2/c	22.4	67500			712
1584	CeO_2+10 wt% Bi_2O_3-B_2O_3-ZnO-SiO_2	950	Cubic flurite Fm3m	22.4	12000	4.5	−57	401
1585	$LaLuO_3$	1525	Orthorhombic Pnma	22.4	14400		−7.5	721
1586	$(1-y)Li_{2.02}Ti_{0.92}Nb_{0.06}O_3$ (y=0.2)	1070	M phase	22.5	13600		14	722
1587	$0.91(Mg_{0.7}Zn_{0.03})TiO_3$-$0.09CaTiO_3$	1310/3h	Ilmenite trigonal R-3	22.5	86000	7.5	3	723
1588	$Zn_{1+0.005}Nb_2O_6$	1300	Pbcn Columbite	22.5	122000	70	−75	644
1589	ZnO-B_2O_3-P_2O_5-TeO_2 glass		Glass	22.5	1500	7	−100	318
1590	$0.95(Mg_{0.7}Zn_{0.3})_{0.95}Co_{0.05}TiO_3$-$0.05Ca_{0.8}Sr_{0.2}TiO_3$	1150	Composite	22.5	90000	9	0	724
1591	$0.9(Mg_{0.95}Co_{0.05})TiO_3$-$0.1Ca_{0.8}Sm_{0.4/3}TiO_3$	1275	Composite	22.5	108000	8	−8	725

1592	$0.75ZnNb_2O_6$-$0.25TiO_2$	1200	Columbite-Orthorhombic Pnca	22.5	15000		−15	545
1593	$0.91(Mg_{0.7}Zn_{0.3})TiO_3$-$0.09CaTiO_3$	1310/3h	Composite	22.5	86000	7.5	3	726
1594	$La_{5/3}MgTaO_6$	1500/6h	Perovskite	22.5	5000	7.2	−80	727
1595	$0.95(Mg_{0.95}Zn_{0.05})TiO_3$-$0.05CaTiO_3$+1 Mol% $LaAlO_3$	1200/4h	Mixture	22.6	89000		−7	728
1596	$NiNb_2O_6$	1150	Columbite Orthorhombic Pbcn	22.6	40100		−38	729
1597	Nd_2BaZnO_5		Tetragonal I4/mcm	22.6	12451	8.9	4.6	730
1598	$La_{2-x/3}Na_x(Mg_{1/2}W_{1/2})O_3$ (x=0.1)	1400	Perovskite	22.6	19700		−34	655
1599	$La_{2-x/3}Na_x(Mg_{1/2}W_{1/2})O_3$ (x=0.2)	1400	Perovskite	22.6	16600		−27	655
1600	$0.94MgTiO_3$-$0.06CaTiO_3$+0.2 mol% Bi_2O_3	1250	Ilmenite Trigonal R-3	22.6	53000	7	−3	665
1601	$0.95MgLi_{2/3}Ti_{4/3}O_4$-$0.05CaTiO_3$	1200/2h	Composite	22.6	48000		−2	637
1602	$0.93(Mg_{0.95}Zn_{0.05})TiO_3$-$0.07CaTiO_3$	1300/4h	Composite	22.6	93000	10	−3	731
1603	$0.7Mg_{0.95}Co_{0.05}TiO_3$-$0.3Zn_{0.975}Ca_{0.025}TiO_3$	1200	Composite	22.6	57000		0	732
1604	$Ca[(Li_{1/3}Nb_{2/3})_{1-x}Sn_x]O_3$ (x=0.3)	1150	Perovskite Orthorhombic	22.6	46300		−39	733
1605	$0.5ZnNb_2O_6$-$0.5Zn_3Nb_2O_8$	1200	Orthorhombic (mixture)	22.7	95500		−65	542
1606	$0.9(Mg_{0.95}Zn_{0.05}Ti)O_3$-$0.1Ca_{0.8}Sm_{0.4/3}TiO_3$	1300	Composite	22.7	124000		−6	734
1607	$0.93(Mg_{0.95}Mn_{0.05})TiO_3$-$0.07CaTiO_3$	1270/4h	Composite	22.7	90700		0.8	735
1608	(1-x)$MgTiO_3$-x$Ca_{0.8}Sr_{0.2}TiO_3$ (x=0.08)		Composite	22.7	72400		14	572
1609	$0.9(Mg_{0.95}Co_{0.05}TiO_3$-$0.1Ca_{0.6}La_{0.8/3}TiO_3$	1225	Composite	22.7	76000		−12	736
1610	$BiCu_2VO_6$	740	Monoclinic $P2_1/n$	22.7	12000	11	−17	737
1611	$0.45TiO_2$-$0.55CeTe_2O_6$	700	Composite	22.8	8300		25	434
1612	$Li_2ZnTi_3O_8$+5 wt% LMZBS	900	Ternary spinel Cubic P4332	22.8	25000		−17	738
1613	$LaAlO_3$+10 mol% $Sr_2Nb_2O_7$	1575/3h	Composite	22.8	18610	7.6	46	739
1614	$CoNb_2O_6$	1100	Columbite Pbcn	22.8	93800		−45	600
1615	$0.92CoNb_2O_6$-$0.08TiO_2$	1150	Columbite Orthorhombic Pnca	22.8	29000		−12	545
1616	$La_{2-x/3}Na_x(Mg_{1/2}W_{1/2})O_3$ (x=0.3)		Perovskite	22.8	11500		45	655

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
1617	CeO_2:1 mol% Nd_2O_3	1650	Cubic flurite Fm3m	22.8	51000		−63	525
1618	$Li_{2.08}TiO_3$+0.13LiF	900/2h	Monoclinic Rock salt C2/c	22.8	63000		1	740
1619	$0.89MgTiO_3$-$0.11(Ca_{0.6}Na_{0.2}Sm_{0.2})TiO_3$	1250	Mixture	22.8	76000	8	−3	741
1620	$Zn(Nb_{0.95}Ta_{0.05})_2O_6$+4.5 wt% CuO	930	Columbite Orthorhombic Pnca	22.9	77200		−71	742
1621	$Ba[Ti_{1-x}(Zn_{1/2}W_{1/2})_x]O_3$ (x=0.55)	1420	Hexagonal perovskite $P6_3/mmc$	22.9	15200		−1	665
1622	$0.9(Mg_{0.95}Ni_{0.05})TiO_3$-$0.1Ca_{0.8}Sm_{0.4/3}TiO_3$	1275/4h	Composite	22.9	92000		−5	743
1623	$(Ca_{1+x}Sm_{1-x})(Al_{1-x}Ti_x)O_4$ (x=0.4)	1400	K_2NiF_4 type Tetragonal I4/mmm	22.9	49100		15	554
1624	$0.7Li_2TiO_3$-0.3ZnO		Composite	23.0	99800	8.91	0	744
1625	Nd_2O_3-TiO_2+BaO-SiO_2-B_2O_3-ZnO-SrO glass	900	Glass	23.0	600			745
1626	Sm_2O_3	1650/2h	Monoclinic C2/m	23.0	46000		22	525
1627	$(Zn_{0.65}Mg_{0.35})TiO_3$+1.5 wt% $BiVO_4$+5 wt% $CaTiO_3$	930	Composite	23.0	16200		1	746
1628	$Ca(Cu_{1/3}Ta_{2/3})O_3$		Complex perovskite	23.0	5500	–	–	609
1629	$0.93MgTiO_3$-$0.07CaTiO_3$ (SPS sintering)	1150/ 10 min	Composite	23.0	7000		–	747
1630	$Ca(Co_{1/3}Ta_{2/3})O_3$		Complex perovskite	23.0	12000	–	−65	609,701
1631	$Ba_{0.99}(Zn_{1/2}W_{1/2})O_{2.99}$	1250/4h	Cubic perovskite Fm3m	23.0	22000		−35	567
1632	$Sr(Ni_{1/3}Ta_{2/3})O_3$		Complex perovskite Trigonal P-3m1	23.0	49000	7	−18	701
1633	$Sr(Co_{1/3}Ta_{2/3})O_3$		Complex perovskite Trigonal P-3m1	23.0	17500	7	−71	701
1634	$Ba(Ni_{1/3}Ta_{2/3})O_3$		Complex perovskite Trigonal P-3m1	23.0	49700	7	−18	701
1635	$La(Co_{1/2}Ti_{1/2})O_3$		Perovskite	23.0	32000		−57	748
1636	$Dy(Mg_{1/2}Ti_{1/2})O_3$	1650/2h	Perovoskite	23.0	36800	10	−6	702
1637	$0.7MgTiO_3$-$0.3MgTa_2O_6$	1460/3h	Mixed phases	23.0	81000		−2	749
1638	$Ca(La_{1/2}Ta_{1/2})O_3$	1600/4h	Complex perovskite Monoclinic $P2_1/n$	23.0	20600		−32	750

1639	$CaTiO_3$-$CaZrO_3$+frit glass (70:15:15)	875	Composite	23.0	2400		0	196
1640	$Sm_2Ba_{0.9}Sr_{0.1}ZnO_5$		Tetragonal	23.0	8520		36	549
1641	CeO_2-CoO_4-TiO_2+0.5 wt% CuO	1050	Mixture	23.0	45000		−55	366
1642	CaO-4NiO-Ta_2O_5-TiO_2	1340	Mixture	23.0	8500	5.5	−48	230
1643	$CoNb_2O_6$	1150	Columbite Orthorhombic Pbcn	23.0	40000		−35	729
1644	$0.4(0.5ZnNb_2O_6$-$0.5Zn_3Nb_2O_8)$-$0.6ZnTa_2O_6$	1275	Composite	23.0	9300		−55	542
1645	CaO-4MgO-Nb_2O_5-TiO_2	1340	Mixture	23.0	52000	5.5	−30	230
1646	2CaO-3ZnO-Nb_2O_5-TiO_2	1140	Mixture	23.0	15000	5.5	−34	230
1647	$Nd(Mg_{1/2}Ti_{1/2})O_3$	1650/2h	Perovskite	23.0	36900	10	−49	702
1648	$Li_2MgTi_3O_8$	1100/5h	Cubic spinel $P4_332$	23.0	54050	7.29	2	751
1649	$Ca[(Li_{1/3}Nb_{2/3})_{1-x}Sn_x]$ $O_{3-\delta}$ (x=0.3)	1150/3h	Perovskite	23.0	46300		−39	752
1650	$0.93(Mg_{0.6}Zn_{0.4})_{0.95}Co_{0.05}TiO_3$-0.07 $CaTiO_3$	1200	Composite	23.0	79400		1	753
1651	$0.93MgTiO_3$-$0.07CaTiO_3$ SPS method	1150/ 10 min	Ilmenite+Perovskite	23.0	70000			754
1652	CeO_2	1675	Cubic flurite Fm3m	23.0	65000		−55	640
1653	Li_2TiO_3+2 wt% ZnO-B_2O_3 frit+0.9 wt% CeO_2	920/4h	Composite	23.0	34900		33	755
1654	$HoTiTaO_6$	1550	Euxenite Orthorhombic	23.1	46900		−8	583
1655	$Nd_{1.95}La_{0\cdot.5}BaZnO_5$		Orthorhombic Pnma	23.1	7165		2	599
1656	Li_2TiO_3+2.5 wt% ZnO-B_2O_3	900/2h	Monoclinic C2/c	23.1	32300		36	756
1657	$Ba_5Li_2W_3O_{13}$+4 wt% BaCu((B_2O_5)	900	Hexagonal Perovskite	23.1	34300		4	757
1658	$Li_2ZnTi_3O_8$+3 wt% LMZBS	900	Cubic $P4_332$	23.2	31300		−16	738
1659	$0.87(Mg_{0.95}Ni_{0.05})TiO_3$-$0.13(La_{0.5}Na_{0.5})TiO_3$	1275/4h	Composite	23.2	86500		3	758
1660	$Li_{2.08}TiO_3$(sol-gel)	1050	Monoclinic C2/c	23.2	56400		38	759
1661	$PrAlO_3$	1650/2h	Perovskite Trigonal R-3m	23.2	51000	10	−25	452
1662	$ZnNb_2O_6$	1200	Columbite Orthorhombic Pnca	23.2	84500	6.3	−76	557
1663	Li_2TiO_3+2 wt% Li_2O-ZnO-B_2O_3	900	Monoclinic C2/c	23.2	38900		30	652

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
1664	$0.2(LiNb_{0.8}Ti_{0.5}O_3)+0.8(Li_{2.02}Nb_{0.06}Ti_{0.92})O_3$	1100	Composite	23.2	14900		14	760
1665	$Na_2BiMg_2V_3O_{12}$	660/4h	Cubic garnet	23.2	3700		8	761
1666	$0.87Li_2TiO_3$-0.05MgO-0.08LiF	950	Composite	23.2	131700		0	762
1667	$Zn(Nb_{1-x}V_{x/2})_2O_{6-2.5x}$ (x=0.15)	975/2h	Columbite Orthorhombic Pbcn	23.3	37000		−71	712
1668	$Ca[(Li_{1/3}Nb_{2/3})_{1-x}Sn_x]O_3$ (x=0.2)	1150/3h	Perovskite	23.3	50600		−30	752
1669	$Ca(La_{1/2}Nb_{1/2})O_3$	1550/4h	Perovskite Monoclinic	23.3	31000		−43	763
1670	$ZnNb_2O_6$+5 wt% CuO+4B_2O_3	900	Columbite Orthorhombic Pnca	23.3	46800		−7	764
1671	$Ca(Li_{1/3}Ta_{2/3})O_3$-δ+6 wt% B_2O_3	1100	Perovskite	23.3	27900	10.99		765
1672	$Ba_2Ca_{1-x}Sr_xWO_6$ (x=0.5)	1200	Perovskite Cubic Fm3m	23.3	45200		−14	766
1673	$Li_2Zn(Ti_{0.9}Sn_{0.1})_3O_8$	1120	Cubic spinel	23.3	71000		−22	672
1674	$ZnNb_2O_6$+1 wt% V_2O_5+1 wt% Bi_2O_3+2.5 wt% CuO	880	Columbite Orthorhombic Pnca	23.4	47000		−45	767
1675	$0.88(Mg_{0.95}Zn_{0.05})TiO_3$-$0.12(Na_{0.5}La_{0.5})TiO_3$		Composite	23.4	103000	9	1	768
1676	$LaAlO_3$+5 mol% $Sr_2Nb_2O_7$	1575/3h	Composite	23.4	20790	10.81	−25	769
1677	$LaAlO_3$	1650/2h	Perovskite Hexagonal R-3m	23.4	68000	10	−44	452
1678	CeO_2:1 mol% Er_2O_3	1650	Cubic flurite Fm3m	23.5	74000		−60	525
1679	$La_6Mg_4Ta_2W_2O_{24}$	1350/4h	$A_{1-d}BO_3$ perovskite Monoclinic	23.5	13600	5.4	−46	770
1680	$0.96(Mg_{0.6}Zn_{0.4})_{0.95}Co_{0.05}TiO_3$-$0.04SrTiO_3$	1250	Mixture phases	23.5	92000		−2	771
1681	$SrHfO_3$	1750/6h	Orthorhombic perovskite Pnma	23.5	33500	9.3	−63	675
1682	$Ba_2Ca_{1-x}Sr_xWO_6$ (x=0.1)	1200	Perovskite Cubic Fm3m	23.5	60100		−16	766
1683	$0.3Li_2TiO_3$-$0.7Li(Zn_{0.5}Ti_{0.5})O_4$	1100	Composite	23.5	88360		0	772
1684	$Ba(Mg_{0.33}Ta_{0.53}Ti_{0.067}W_{0.067})O_3$	1590	Perovskite	23.6	75900	5.7	−3	438
1685	$La_{2/3}(Mg_{1/2}W_{1/2})O_3$	1250	Orthorhombic I222	23.6	32500		−43	655,773
1686	(1-x)Li_2TiO_3+xLiF (x=0.1)	1100/2h	Composite	23.6	10800		4	774
1687	$La_{2/3}(Mg_{1/2}W_{1/2})O_3$+2 mol% TiO_2	1330	Orthorhombic I222	23.6	14800		−10	775
1688	$Zn_{0.95}Mg_{0.05}TiO_3$+0.25 TiO_2+1 wt% 3ZnO-B_2O_3	940/2h	Composite	23.6	30990	7.75	−8	776

1689	$Sr_{1-x}Nd_{1-x}Al_{1-x}Ti_xO_4$ (x=0.6)		Tetragonal I4/mmm	23.6	86300		11	777
1690	$(Ni_{1-x}Zn_x)Nb_2O_6$ (x=0.2)	1300	Columbite Orhorhombic Pbcn	23.6	18900		−62	778
1691	$(Zn_{1-x}Mg_x)Nb_2O_6$	1150-1350	Columbite Orthorhombic Pnca	23.6-19.2	81220-33110		−71 to −29	705
1692	$SrLa_2Mg_2W_2O_{12}$	1525	Orthorhombic	23.7	15900		0	645
1693	$Li_2MgTi_3O_8$+5 wt% LMZBS	925	Ternary spinel Cubic $P4_332$	23.7	38000		0	738
1694	(1-x)$Li_3Bi_2P_3O_{12}$-xTiO_2 (x=0.6)	760	Monoclinic $P2_1/m$	23.8	15300		23	456
1695	$CaZrO_3$ (nanopowder)	1500/4h	Perovskite Pbnm	23.8	30600	5.65	1.4	779
1696	$Zn(Nb_{1-x}V_{x/2})_2O_{6-2.5x}$ (x=0.025)	1000/2h	Columbite Orthorhombic Pnca	23.8	64000		−50	712
1697	$Zn_{1+x}Nb_2O_6$ (x=0.01)	1250	Columbite Orthorhombic Pnca	23.8	120000		−73	780
1698	$NiZrNb_2O_8$	1200	Monoclinic Wolframite P2/c	23.8	40300		−28	781
1699	$MgZrNb_2O_8$+1 wt% H_3BO_3	1200/4h	Monoclinic P2/c	23.8	58900		−13	782
1700	$Zn(Nb_{0.94}V_{0.06})_2O_6$	875/2h	Columbite Orthorhombic Pbcn	23.9	65000		−73	713
1701	CeO_2:1 mol% Sm_2O_3	1650	Cubic flurite Fm3m	23.9	90000		−50	525
1702	$Sr_2La_2MgW_2O_{12}$	1525	Orthorhombic	23.9	35000		−83	645
1703	$Ba_2Ca_{0.975}Sr_{0.025}WO_6$	1250	Perovskite Cubic Fm3m	23.9	80200		18	766
1704	$Ba_2Ca_{1-x}Sr_xWO_6$ (x=0.05)	1225	Perovskite Cubic Fm3m	24.0	77800		−20	766
1705	$Ba[Ti_{1-x}(Co_{0.5}W_{0.5})_x]O_3$ (x=0.9)	1425	Perovskite	24.0	20700		−18	519
1706	$Ba_{0.98}(Zn_{1/2}W_{1/2})O_{2.98}$	1250/4h	Cubic perovskite Fm3m	24.0	31000		−40	567
1707	$0.85(Mg_{0.95}Ni_{0.05})TiO_3$-$0.15Ca_{0.61}Nd_{0.26}TiO_3$	1350	Composite	24.0	67000		−9	783
1708	Li_2TiO_3+2.5 wt% LiF	950	Monoclinic C2/c	24.0	75500		36	784
1709	CeO_2: 1mol% CaO	1675	Cubic flurite Fm3m	24.0	120000	5.48	−60	640
1710	CeO_2+1 mol% Sm_2O_3	1650/2h	Cubic flurite Fm3m	24.0	90000		−50	525
1711	2CaO-3CoO-Ta_2O_5-TiO_2	1260	Mixture	24.0	13500	5.3	−19	230
1712	$Ba_8Ta_6Ni_{0.25}Mg_{0.75}O_{24}$			24.0	93000		25	785
1713	$Ca(Li_{1/3}Ta_{2/3})O_3$-δ	1200	Perovskite	24.0	42300	10.8		765
1714	BaO-TiO_2-WO_3+5 wt%% ZnO-$2B_2O_3$	1100	Composite	24.0	13000	9.4		786
1715	BaO-0.32MgO-0.25WO_3-0.43TiO_2	1500/6h	Composite	24.0	19500		34	407
1716	$Ba(Mg_{1/3}Ta_{2/3})O_3$	1640/20h	Complex perovskite Trigonal P-3m1	24.0	430000	10	5	787

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
1717	$Ca(In_{1/2}Ta_{1/2})O_3$	1600/4h	Complex perovskite Monoclinic $P2_1/n$	24.0	16700		−35	750
1718	$Ca(Pr_{1/2}Ta_{1/2})O_3$	1600/4h	Complex perovskite Monoclinic $P2_1/n$	24.0	22200		−31	750
1719	$LiNb_3O_8$	1075	α-PbO_2 type Monoclinic $P2_1/a$	24.0	58000		−96	788
1720	$Nd_{0.3}Dy_{0.7}TiNbO_6$			24.0	27750		−22	564
1721	$Ca(Li_{1/3}Ta_{2/3})O_3$-δ+3 wt% B_2O_3	1100	Perovskite	24.0	40300	10.86		765
1722	$(Zn_{0.3}Co_{0.7})Ti_{1-x}Sn_xO_3$ (x=0.02)	1220/4h	Cubic spinel+rutile	24.0	66700		−5	789
1723	$0.75(Al_{1/2}Ta_{1/2})O_2$-$0.25(Ti_{1-x}Sn_x)O_2$	1450/3h	Tetragonal TiO_2 type	24-30	55000-80000		−25 to 15	790
1724	$0.85Ba(Mg_{1/3}Ta_{2/3})O_3$-$0.15BaSnO_3$	1640/20h	Complex perovskite Trigonal P-3m1	24.0	330000		−1	791
1725	$La_{3/4}Mg_{2/4}Ta_{1/4}W_{1/4}O_3$	1350/4h		24.0	13600		−46	770
1726	$La_{2/3}(Mg_{1/2}W_{1/2})O_3$+2 mol% TiO_2		Orthorhombic I222	24.0	14800	6	10	775
1727	Sm_2SrZnO_5		Tetragonal	24.1	19283	8.1	−97	549
1728	$Ca(Li_{1/3}Ta_{2/3})O_3$-δ+1 wt% B_2O_3	1100	Perovskite	24.1	38900	10.8		765
1729	$0.20MgAl_2O_4$-$0.80TiO_2$	1460	Composite	24.1	48900	5.5	11	195
1730	$Ca[(Li_{1/3}Nb_{2/3})_{0.8}Ti_{0.2}]O_{3-d}$+15 wt% LMZBS	900	Complex Perovskite Orthorhombic	24.1	13500		−21	792
1731	$Li_2(Mg_{0.3}Zn_{0.7})Ti_3O_8$-$0.12TiO_2$+2 wt% BaO-$B_2O_3$-$SiO_2$	900	Spinel	24.1	22000		−4	793
1732	$Ba(Sn,MgTa)O_3$		Complex perovskite Hexagonal P-3m1	24.2	120000	6.0		794
1733	$Ca(Pr_{1/2}Nb_{1/2})O_3$	1550/4h	Complex perovskite Monoclinic	24.2	31500		−39	763
1734	$Ba[Ti_{1-x}(Ni_{1/2}W_{1/2})_x]O_3$ (x=0.5)	1425	Perovskite	24.2	35000		−6	616
1735	$Ba_8Ta_6(Ni_{1-x}Mg_x)O_{24}$ (x=0.75)		Complex perovskite	24.2	93100		26	785
1736	$Ba(Mg_{1/2}Ta_{2/3})O_3$:0.5mol% $Ba(Mg_{1/2}W_{1/2})O_3$		Complex perovskite Trigonal P-3m1	24.2	400000	10		795
1737	(1-x)$MgTiO_3$-x$Ca_{0.8}Sr_{0.2}TiO_3$ (x=0.1)		Composite	24.2	59200		35	572

1738	$Bi[Sb_{1-x}(Nb_{0.992}V_{0.008})_x]O_4$ (x=0.1)		Monoclinic I2/c	24.2	33000		−46	715
1739	$BaHfO_3$	1750/6h	Cubic perovskite Pm-3m	24.2	14250	8.9	111	675
1740	$Li_2ZnTi_3O_8$+1 wt% LMZBS	925	Ternary spinel Cubic $P4_332$	24.3	58000		−14	738
1741	$Li_2ZnTi_3O_8$+1 wt% LZB	925	Ternary spinel Cubic $P4_332$	24.3	41400		−13	796
1742	$Sm_2Ba_{0.75}Sr_{0.25}ZnO_5$		Orthorhombic Pnma	24.3	8670	8.17	30	549
1743	$0.85(Mg_{0.95}Zn_{0.05})TiO_3$-$0.15Ca_{0.61}Nd_{0.26}TiO_3$	1300	Mixed phases	24.3	112000	8	−10	797
1744	$0.9ZnNb_2O_6$-$0.1(2ZnO\text{-}V_2O_5)$	950	Columbite Orthorhombic	24.3	72800		–	678
1745	In_2O_3-TiO_2-Ta_2O_5	1525	Composite	24.3	15400		39	583
1746	$0.5Zn_3Nb_2O_8$-$0.5ZnNb_2O_6$	1200/2h	Composite	24.3	95500		−65	542
1747	$0.82BiSbO_4$-$0.18Bi_2Mo_2O_9$	825	Composite	24.3	24000		−4	798
1748	$0.92NaMg_4V_3O_{12}$-$0.08CaTiO_3$	730/4h	Composite	24.3	29200	10.5	−4	382
1749	$LaTiTaO_6$	1530	Multphase	24.4	45300		−39	583
1750	$Sm_2Ba_{0.15}Sr_{0.85}ZnO_5$		Orthorhombic Pnma	24.4	12200	8.19	3	549
1751	$(Ca_2Mg_3)Ta_2(Ti_{0.75}Zr_{0.25})O_{12}$	1375		24.4	12400		−32	799
1752	$Ca(Nd_{1/2}Ta_{1/2})O_3$	1600/4h	Complex perovskite Monoclinic $P2_1/n$	24.4	22400		−30	750
1753	$0.84(Mg_{0.95}Co_{0.05})TiO_3$-$0.16(Na_{0.5}Nd_{0.5})TiO_3$		Ilmenite Trigonal R-3	24.4	70000		2	800
1754	$(Ni_{1-x}Zn_x)Nb_2O_6$ (x=0.2)	1280	Columbite Orthorhombic Pbcn	24.4	24300		−64	778
1755	$Li_2MgTi_3O_8$+3 wt% LMZBS	925	Ternary spinel cubic $P4_332$	24.5	44000		0	738
1756	$0.99(Mg_{0.7}Zn_{0.3})_{0.95}Co_{0.05}TiO_3$-0.1 $(La_{0.5}Na_{0.5})TiO_3$	1150/4h	Composite	24.5	68000		0	801
1757	$Sm_2Ba_{0.1}Sr_{0.9}ZnO_5$		Orthorhombic Pnma	24.5	14950	8.2	−36	549
1758	$Ba(Mg_{0.33}Ta_{0.63}Ti_{0.017}W_{0.017})O_3$	1600	Complex perovskite Trigonal P-3m1	24.5	100700	5.4	13	438
1759	$Ca(Nd_{1/2}Nb_{1/2})O_3$	1550/4h	Complex perovskite Monoclinic	24.5	31800		−37	763
1760	$Sm_2Ba_{0.05}Sr_{0.95}ZnO_5$		Orthorhombic Pnma	24.6	8690	8.2	82	549
1761	$Li_{2+x}TiO_3$ (x=0.08)		Monoclinic C2/c	24.6	66000		22	802
1762	$Ba_4LiNb_{3-x}Sb_xO_{12}$ (x=1)	1400/4h	Cubic Im3m	24.6	52100		0	803

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
1763	$0.85(Mg_{0.95}Ni_{0.05})TiO_3$-$0.15Ca_{0.6}La_{0.8/3}TiO_3$	1325	Composite	24.6	102000		−4	804
1764	$Zn_{0.95}Mg_{0.05}TiO_3$+0.25TiO_2+1 wt% 3ZnO-B_2O_3	880	Composite	24.6	4000		−14	805
1765	$Li_2ZnTi_3O_8$+0.5 wt% LMZBS	1000	Ternary spinel Cubic $P4_332$	24.6	70000		−14	738
1766	(1-x)$(Mg_{0.95}Ni_{0.05})TiO_3$-x$Ca_{0.6}La_{0.8/3}TiO_3$ (x=0.15)	1325	Ilmenite Trigonal R-3	24.6	102000		−4	708
1767	(1-x)$(Mg_{0.095}Zn_{0.05})TiO_3$-x $(Na_{0.5}Nd_{0.5})TiO_3$ (x=0.16)	1300	Composite	24.7	82000	9	0	806
1768	$Mg_4Al_2Ti_9O_{25}$		Psuedobrookite Bbmm	24.7	30,000			807
1769	$Ba(Mg_{1/3}Ta_{2/3})O_3$ Annealed 1500/50h WGM		Complex perovskite Trigonal P-3m1	24.7	326250	13.05	8	808
1770	$Ba_{0.9925}(Mg_{0.33}Ta_{0.67})O_3$	1600	Complex perovskite Trigonal P-3m1	24.7	152, 00	5.7	1	809
1771	$La(Mg_{2/3}Ta_{1/3})O_3$	1600	Perovskite	24.7	65500	10	−65	810
1772	$Li_2(Zn_{0.92}Co_{0.08})Ti_3O_8$	1140	Ternary spinel Cubic $P4_332$	24.7	140000		−13	811
1773	$Ca(Sm_{1/2}Nb_{1/2})O_3$	1550/4h	Complex perovskite Monoclinic	24.7	33200		−34	763
1774	0.5$Mg_4Nb_2O_9$-0.5$CaTiO_3$		Composite	24.8	82000	9.1	0	812
1775	$Mg_{0.95}Co_{0.05}Ti_2O_4-0.78TiO_2$		Composite	24.8	38500		−1	813
1776	$Ca[Li_{0.33}Nb_{0.67}]_{0.9}Ti_{0.1}]O_{3-\delta}$+10 wt% LiF	900	Composite	24.8	19300	4.2	−15	664
1777	$SmTaTi_{0.25}Zr_{0.75}O_6$			24.9	25200		−44	671
1778	$Ba(Zn_{1/6}Co_{1/6}Ta_{2/9}Nb_{2/9}Sb_{2/9})O_3$	1575/6h	Perovskite	24.9	83000		−13	814
1779	$(Ni_{1-x}Zn_x)Nb_2O_6$ (x=0.4)	1220	Columbite Orthorhombic Pbcn	24.9	35400		−66	778
1780	0.85$MgTiO_3$-0.15$Ca_{0.6}La_{0.8/3}TiO_3$+0.5 wt% ZnO	1250	Composite	24.9	65200	8	0	815
1781	0.93$(Mg_{0.95}Ni_{0.05})_2TiO_4-0.07SrTiO_3$	13404h	Composite	24.9	98000	9.8	1	816
1782	$Ba[Mg_{1-x}Zn_x]_{1/3}Ta_{2/3}]O_3$		Complex perovskite Trigonal P-3m1	24-26	200000-300000	8	−2	817
1783	CaO-ZrO_2-glass		Glass	25.0	3500			818

1784	$Ba(Co_{1/3}Ta_{2/3})O_3$	1500	Perovskite Trigonal P-3m1	25.0	71400		−16	701
1785	$Ca(Eu_{1/2}Nb_{1/2})O_3$	1550/4h	Complex perovskite Monoclinic	25.0	35800		−30	763
1786	$La(Co_{1/2}Ti_{1/2})O_3$	1550	Complex perovskite	25.0	67000		−42	748,819
1787	$Ca(Ga_{1/2}Ta_{1/2})O_3$	1500/2h	Complex perovskite Orthorhombic Pnma	25.0	80000		−81	820
1788	$Ca(Al_{1/2}Nb_{1/2})O_3$	–	Complex perovskite Orthorhombic	25.0	7500		−87	609
1789	Sr_2AlNbO_6	1600	Complex perovskite	25.0	4100		−3	562
1790	$Ca(Zn_{1/3}Ta_{2/3})O_3$		Complex perovskite	25.0	25,000	–	−66	609
1791	$ZnNb_2O_6$	1150/2h	Columbite Orthorhombic Pnca	25.0	83700		−56	729
1792	$NiTa_2O_6$	1600	Tetragonal $P4_2/mmm$	25.0	31000		35	600
1793	$Pr_{0.1}Gd_{0.9}TiNbO_6$	1385	Aeschenite Orthorhombic Pcan	25.0	3450		−15	564
1794	$Ca[(Li_{1/3}Nb_{2/3})_{1-x}Sn_x]\ O_{3-\delta}$ (x=0.15)	1150/3h	Perovskite	25.0	49100		−25	752
1795	$(Sr_{2/3}La_{1/3})(Li_{1/3}Ta_{2/3})O_3$		Perovskite	25.0	25000			821
1796	$La_6Mg_4Nb_2W_2O_{24}$	1400/4h	Perovskite Monoclinic	25.0	16400	5.4	−56	770
1797	$(Zn_{0.9}Mg_{0.1})TiO_3$+4 wt% Bi_2O_3	1000/4h	Composite	25.0	70000		−10	822
1798	$Sr(In_{1/2}Nb_{1/2})O_3$+0.2 wt% B_2O_3	1350/4h	Complex perovskite	25.0	38600		−63	823
1799	$Sm(Mg_{1/2}Ti_{1/2})O_3$	1650/2h	Perovskite Orthorhombic $Pnm2_1$	25.0	65500	10	−26	702
1800	$BaO\text{-}TiO_2\text{-}WO_3$ (N-35):5 wt% $PbO\text{-}SiO_2\text{-}B_2O_3$	1100	Composite	25.0	6500	6	–	786
1801	$Ba_3MgNb_{2-x}Sb_xO_9$ (x=0.25)		Perovskite Trigonal P-3m1	25.0	96290	5.6	6	381
1802	$Sr_{2/3}La_{2/3}[Li_{1/3}Ta_{2/3}]O_3$	1350	Monoclinic $P2_1/c$	25.0	25200	10.2	−25	821,824
1803	$(1\text{-}x)(Mg_{0.95}Zn_{0.05})TiO_3\text{-}xCa_{0.6}La_{0.8/3}TiO_3$ (x=0.15)	1320/4h	Composite	25.0	86000		1	465
1804	$(Zn_{0.65}Mg_{0.35})TiO_3\text{-}0.15TiO_2$+1 wt% $CaO\text{-}B_2O_3\text{-}SiO_2$	950	Composite	25.0	47000		10	825
1805	$BaTe_4O_9$+40 wt% $TiTe_3O_8$	575	Composite	25.0	19300		−3	826
1806	$Ba_{4-5x}Mg_xNb_{2-y}O_9$ (x=0.425, y=0.002)	1320	Trigonal P-3m1	25.0	160000		1	827
1807	$(Ni_{1-x}Zn_x)Nb_2O_6$ (x=0.6)	1260	Columbite Orthorhombic Pbcn	25.0	53400		−68	778
1808	$La(Co_{1/2}Ti_{1/2})O_3$	1550	Perovskite Orthorhombic Pbnm	25.0	38000		−42	828

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
1809	$Li_2ZnTi_3O_8$+2 wt% MgO-B_2O_3-SiO_2	900/4h	Ternary spinel Cubic $P4_332$	25.0	56200		−10	829
1810	$Li_2ZnTi_3O_8$+1.5 wt% B_2O_3	925/4h	Ternary spinel Cubic $P4_332$	25.0	49600		−11	830
1811	$0.4Li_2Zn_3Ti_4O_{12}$-$0.6TiO_2$	1175	Composite	25.1	62000		−5	831
1812	$0.9LaAlO_3$-$0.1SrTiO_3$	1680	Perovskite Composite	25.1	128000	10	−51	832
1813	$Sm_2Ba_{0.25}Sr_{0.75}ZnO_5$		Tetragonal	25.1	1900	8.17	18	549
1814	$Ba(Mg_{0.3183}Ta_{0.67})O_3$	1600	Perovskite Hexagonal P-3m1	25.1	120500	5.6	3	809
1815	$Ba_4LiTa_2SbO_{12}$	1480	Hexagonal Perovskite $P6_3mc$	25.1	77700		−4	833
1816	$Li_2(Mg_{0.3}Zn_{0.7})Ti_3O_8$-$0.12TiO_2$+3 wt% ZBS	900/3h	Ternary spinel Cubic $P4_332$	25.1	19600		2	834
1817	$Ca[(Li_{1/3}Nb_{2/3})_{1-x}Sn_x]O_3$ (x=0.1)	1150/3h	Perovskite	25.2	48200		−14	752
1818	$0.17Ba_5Nb_4O_{15}$-$0.83BaNb_2O_6$	1300	Composite	25.2	59300		0	835
1819	90 wt% $CoNb_2O_6$+10 wt% $CaTiO_3$	1150	Composite	25.2	21700		2	545
1820	$0.5ZnAl_2O_4$-$0.5TiO_2$		Composite	25.2	277000		177	406
1821	$Bi(In_{1/3}Mo_{2/3})O_4$	840	Monoclinic C2/c	25.2	40000		−65	836
1822	1-xCeO_2-xYb_2O_3 (x=0.25)	1650	Cubic flurite Fm3m	25.2	47800		−60	413
1823	$Li_2MgTi_3O_8$+1 wt% LMZBS	950	Ternary spinel Cubic $P4_332$	25.2	55000		1	738
1824	$Li_2Cu_{0.1}Zn_{0.9}Ti_3O_8$	950	Ternary spinel Cubic $P4_332$	25.2	32100		2	837
1825	$Sm_2Ba_{0.5}Sr_{0\cdot5}ZnO_5$		Tetragonal	25.3	10075	8.1	30	549
1826	$Li_2ZnTi_3O_8$+0.25 wt% ZnO-B_2O_3	950	Ternary spinel Cubic $P4_332$	25.3	61600		−13	838
1827	TeO_2+7.5 wt% $CaTiO_3$		Composite	25.3	10200		−16	444
1828	$0.9MgNb_2O_6$-$0.1TiO_2$	1300	Composite	25.4	19000		−23	545
1829	1-xCeO_2-xEu_2O_3 (x=0.1)	1650	Cubic flurite Fm3m	25.4	70300		−64	413
1830	$Ba[Ti_{1-x}(Zn_{1/2}W_{1/2})_x]O_3$ (x=0.5)	1420	Cubic perovskite Pm3-m	25.4	11800		9	695
1831	$Li_2MgTi_3O_8$+0.5 wt% LMZBS	975	Ternary spinel Cubic $P4_332$	25.4	51000		2	738
1832	$PbMoO_4$	850	Scheelite Tetragonal $I4_1/a$	25.4	35200		−21	49
1833	$La(Mg_{0.5}Ti_{0.5})O_3$+30 wt% La_2O_3-B_2O_3-TiO_2 glass	1200/3h	Composite	25.4	13200		−55	839
1834	$Ba_5Li_2W_3O_{13}[Ba(Li_{2/5}W_{3/5})O_3]$	1120	Hexagonal Perovskite	25.4	39000		10	757

1835	$0.6Li_2ZnTi_3O_8$-$0.4Li_2TiO_3$+1 wt% ZnO-B_2O_3-SiO_2	900	Mixture	25.4	86400		−1	840
1836	$Nd_2Ba_{0.5}Sr_{0.5}ZnO_5$		Tetragonal I4/mcm	25.5	6120		26	730
1837	$Sm(Co_{1/2}Ti_{1/2})O_3$	1360/4h	Perovskite Orthorhombic $Pnm2_1$	25.5	76000	10	−16	841
1838	$Ba[Mg_{1/3}(Nb_{1/4}Ta_{3/4})_{2/3}]O_3$		Complex perovskite Triagonal P-3m1	25.5	140600		5	842
1839	$Ca_2Mg_3(Ta_{1.75}Sb_{0.25})TiO_{12}$	1375	Mixture phases	25.5	13500		−24	843
1840	$0.85MgTiO_3$-$0.15Ca_{0.6}La_{0.8/3}TiO_3$	1275/4h	Composite	25.5	82500		0	844
1841	$Ba(In_{1/2}Ta_{1/2})O_3$+0.5 wt% Nb_2O_5	1575	Complex perovskite cubic Fm3m	25.5	40050		26	845
1842	$BaMg_{1/3}Nb_{2/3}O_3$-$Mg_4Nb_2O_9$	1320	Composite	25.5	160000		0	846
1843	$Ca(Gd_{1/2}Nb_{1/2})O_3$	1550/4h	Complex perovskite Monoclinic	25.5	11000		−26	763
1844	$(Ni_{1-x}Zn_x)Nb_2O_6$ (x=0.8)	1220	Columbite Orthorhombic Pbcn	25.6	90400		−71	778
1845	$Ba_{10}Ta_{7.04}Ti_{.045}Sn_{0.75}O_{30}$		Hexagonal $P6_3mmc$	25.6	59100		30	464
1846	$(Zr_{0.8}Sn_{0.2})TiO_4$+10 wt% BaO-B_2O_3-SiO_2-Li_2O-CuO	1000/4h	Composite	25.6	13000		−8	515
1847	$Li_2ZnTi_3O_8$	1075	Ternary spinel Cubic $P4_332$	25.6	72000		−11	847
1848	$Li_2ZnTi_3O_8$+0.75 wt% ZnO-B_2O_3-SiO_2	925	Ternary spinel Cubic $P4_332$	25.6	51600		−11	848
1849	$Li_2ZnTi_3O_8$+1.5 wt% Bi_2O_3+0.25 wt% CuO+1.5 wt% V_2O_5	875	Spinel cubic $P4_332$	25.6	53400		−5	849
1850	$CaHfO_3$	1750	Orthorhombic	25.6	15900	9.7	−33	850
1851	Nd_2SrZnO_5			25.7	25830	9.7	−80	58,730
1852	$Ba_5Nb_3TaO_{15}$	1500	Trigonal P-3m1 perovskite	25.7	21600	4.93	16	851
1853	$LiMgTi_3O_8$+3 wt% MgO-3 wt% LiF	825	Spinel cubic	25.7	57100		−4	852
1854	$0.4(Al_{1/2}Ta_{1/2})O_2$-$0.6(Mg_{1/2}Ta_{2/3})O_2$	1450	Tetragonal	25.8	111230		−5	214
1855	$0.8Mg_{0.95}Co_{0.05}TiO_3$-$0.2Ca_{0.6}La_{0.8/3}TiO_3$	1300	Composite	25.8	80000	0	−11	853
1856	$La_6Mg_4Ta_2W_2O_{24}$	1400/4h		25.8	16400		−56	770
1857	$Ca(Sm_{1/2}Ta_{1/2})O_3$	1600/4h	Complex perovskite Monoclinic $P2_1/n$	25.8	25000		−25	750
1858	$Ca(Yb_{1/2}Ta_{1/2})O_3$	1600/4h	Complex perovskite Monoclinic $P2_1/n$	25.8	59200		−21	750

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
1859	$Li_2ZnTi_3O_8$	1100	Spinel cubic $P4_332$	25.8	78200		−11	854
1860	$Li_2(Mg_{0.94}Mn_{0.06})Ti_3O_8$	1075	Ternary spinel cubic $P4_332$	25.8	39400		−13	855
1861	$0.4(Mg_{0.95}Co_{0.05})_4Ta_2O_9$-$0.6CaTiO_3$	1375/4h	Composite	25.8	200000		−5	437
1862	$Li_3ZnTi_3O_8$+1 wt% H_3BO_3	880/4h	Ternary spinel Cubic $P4_332$	25.9	50200		−7	856
1863	$Li_2ZnTi_3O_8$+1.5 wt% B_2O_3+3 wt% TiO_2	900	Ternary spinel Cubic $P4_332$	25.9	46500		0	857
1864	$Li_2Mg_{0.4}Zn_{0.6}Ti_3O_8$	1075/4h	Ternary spinel Cubic $P4_332$	25.9	65000		−8	858
1865	$Sr(Yb_{0.5}Ta_{0.5})O_3$+0.5 wt% Nb_2O_5	1600/4h	Complex perovskite Orthorhombic Pnma	25.9	32300		−79	859
1866	$Ca(Ni_{1/3}Nb_{2/3})O_3$		Complex perovskite Orthorhombic	26.0	11000	–	−78	609
1867	85 wt% $BaTi_4O_9$+15 wt% Li_2O-B_2O_3-SiO_2-CaO-Al_2O_3	875	Composite	26.0	10200		0	592
1868	$0.85(Mg_{0.95}Zn_{0.05})TiO_3$-$0.15Ca_{0.6}La_{0.8/3}TiO_3$	1320/4h	Composite	26.0	86000		0.5	465
1869	$0.5LaCa_{0.5}Zr_{0.5}O_3$-$0.5CaTiO_3$	1575	Composite	26.0	13500	4.5	−67	522
1870	$Nd(Mg_{1/2}Ti_{1/2})O_3$	1650/2h	Perovskite Monoclinic P21/n	26.0	60000		−72	702,860
1871	$Ca(Sm_{1/2}Ta_{1/2})O_3$	1600/4h	Complex perovsite	26.0	25000		−25	750
1872	$Ca(Er_{1/2}Ta_{1/2})O_3$	1600/4h	Complex perovskite	26.0	29600		−12	750
1873	$Ca(Yb_{1/2}Ta_{1/2})O_3$	1600/4h	Complex perovskite	26.0	59200		−21	750
1874	$Sr(Yb_{1/2}Ta_{1/2})O_3$	1600/4h	Complex perovskite	26.0	32300		−79	861
1875	$Sr(In_{1/2}Nb_{1/2})O_3$	1600/4h	Perovskite	26.0	32700		−62	823
1876	BaO-TiO_2-WO_3 (N-35):5 wt% BaO-SiO_2-B_2O_3	1100	Composite	26.0	8400	6.1	–	862
1877	$Sr_3Ti_2O_7$	1300/5h	Tetragonal I4/mmm	26.0	2400	4		53
1878	$LaYbO_3$	1600/4h	Orthorhombic Pnma	26.0	20600	7	−22	863
1879	$0.75Ca_2AlNbO_6$-$0.25Ca_3Nb_2O_8$		Mixture phases	26.0	13200	6.97	−14	864
1880	$2CaO$-$3NiO$-Ta_2O_5-TiO_2	1410	Composite	26.0	11000	4.9	−41	230
1881	$Ca_5Nb_2ZrO_{12}$	1690	Perovskite	26.0	22800	4.8	−25	662
1882	$3CaO$-$2ZnO$-Nb_2O_5-TiO_2	1325	Composite	26.0	22000	5.3	−25	230

1883	$2CaO\text{-}3MgO\text{-}Ta_2O_5\text{-}TiO_2$	1450	Composite	26.0	30000	5.1	−28	230
1884	$0.2CaTiO_3\text{-}0.8Sm(Mg_{0.5}Ti_{0.5})O_3$	1550	Composite	26.0	13500	6	−33	865
1885	MWF-38+10 wt% $Li_2O\text{-}B_2O_3\text{-}SiO_2\text{-}CaO\text{-}Al_2O_3$ (52.45:31.06:11.99:2:2.5)	875	Composite	26.0	10200		−4	510
1886	$Ca(Ta_{2-x}Nb_x)O_6$ (x=1.2)	1450	Orthorhombic Pbcn	26.0	25300		54	460
1887	$1.3Bi_2O_3\text{-}MoO_3$	820	P2/a	26.0	4000		−139	494
1888	$Ba_3Co_{1+y}Nb_2O_9$+y (y=0.07)	1470	Perovskite Trigonal P-3m1	26.0	90000	10	−5	866
1889	$Sr(In_{1/2}Nb_{1/2})O_3$+0.5 wt% CeO_2	1600/4h	Complex perovskite Orthorhombic	26.0	32700		−62	823
1890	$Ba(Zn_{1/3}Ta_{2/3})O_3$+5 mol% B_2O_3+10 mol% CuO	870/2h	Complex perovskite Trigonal P-3m1	26.0	11000		0	867
1891	$MgZrNb_2O_8$	1340/4h	Wolframite Monoclinic P2/c	26.0	120800	6.85	−50	868
1892	$MgZrNb_2O_8$+2 wt% $BaCu(B_2O_5)$	1100/4h	Monoclinic P2/c	26.0	65100	8.7	−47	869
1893	$Ba_{10}Ta_{7.04}Sn_{0.75}O_{30}$		Hexagonal $P6_3mmc$	26.0	59100		–	870
1894	$Li_2Mg(Ti_{1-x}Sn_xg_{0.06})_3O_8$ (x=0.15)	1100/4h	Spinel Cubic $P4_332$	26.0	74700		−5	871
1895	$0.5CeO_2\text{-}0.25ZnO\text{-}0.25TiO_2$	1250	Mixture phases	26.1	24100	5.1	−43	488
1896	$Ca[(Li_{1/3}Ta_{2/3})_{.95}Ti_{0.05}]O_{3\text{-}d}$+3 wt% B_2O_3	1050/4h	Perovskite	26.1	22000	10.3	−97	765
1897	$0.35(Al_{1/2}Ta_{1/2})O_2\text{-}0.65(Mg_{1/3}Ta_{2/3})O_2$	1450	Composite	26.1	112500		0	214
1898	$ZnNb_2O_6$	1200	Columbite Orthorhombic Pbcn	26.1	103730		−73	778
1899	$Li_2(Zn_{0.94}Mg_{0.06})Ti_3O_8$	1140	Ternary spinel Cubic $P4_332$	26.1	150000		−14	811
1900	$0.9Li_2ZnTi_3O_8\text{-}0.1TiO_2$	1100	Ternary spinel Cubic $P4_332$	26.1	44500		−1	872
1901	$0.81Mg_{0.95}Ni_{0.05}TiO_3$-$0.19Nd_{0.5}Na_{0.5}TiO_3$	1300	Composite	26.1	69100		−6	873
1902	$Li_2ZnTi_3O_8$+1 wt% LZB+3.5 wt% TiO_2	900/4h	Ternary spinel Cubic $P4_332$	26.1	45200		−4	874
1903	$0.8(Mg_{0.95}Zn_{0.05})TiO_3$-$0.2Ca_{0.61}Nd_{0.26}TiO_3$+1 wt% V_2O_5	1275	Composite	26.1	46000	8	2	875
1904	$Bi(Ga_{1/3}Mo_{2/3})O_4$	830	Monoclinic sheelite C2/c	26.1	49800		−86	876
1905	$Ca_2Mg_3Nb_4TiO_{17}$	1525		26.2	13750		−24	877

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
1906	$MgTa_{1.3}Nb_{0.7}O_6$	1450	Columbite tetragonal $P4_2/mmm$	26.2	43100		−4	878
1907	$Nd(Mg_{0.5}Ti_{0.5})O_3$+10 mol% B_2O_3	1325	Monoclinic $P2_1/n$	26.2	61300	9.63	−46	879
1908	1-xCeO_2-xDy_2O_3 (x=0.20)	1650	Cubic flurite Fm3m	26.2	70150		−57	413
1909	0.87$(Mg_{0.7}Zn_{0.3})TiO_3$-0.13$(Ca_{0.61}La_{0.26})TiO_3$	1270	Composite	26.2	120000		−3	880
1910	$(Zn_{0.65}Mg_{0.35})TiO_3$+1 wt% CuV_2O_6+9 wt% TiO_2	930	Composite	26.2	31930		−0	881
1911	$Li_2ZnTi_3O_8$	1050	Ternary spinel Cubic $P4_332$	26.2	62000		−15	882
1912	TeO_2+17.5 wt% $SrTiO_3$	610	Composite	26.2	12000		16	444
1913	$Ca[(Li_{1/3}Nb_{2/3})_{0.8}Ti_{0.2}]O_{3-d}$+12 wt% LMZBS glass	900/4h	Composite	26.2	13000	4.8	−20	792
1914	$Ba(Mg_{0.30}Ta_{0.60}Ti_{0.10})O_3$	1600	Complex perovskite Trigonal P-3m1	26.3	100000	5.2	14	883
1915	0.5CeO_2-0.25MnO-0.25TiO_2	1200	Mixture phases	26.3	17100	5	−30	488
1916	(1-x)$(Mg_{0.95}Zn_{0.05})TiO_3$-x$(Ca_{0.6}La_{0.8/3})TiO_3$ (x=0.21)		Composite	26.3	60700	6.44	0	884
1917	$(Ca_2Mg_{3.75}Pb_{0/.25})Ta_2(Ti_{0.75}Zr_{0.25})O_{12}$	1375		26.3	14000		−22	799
1918	$(Ag_{0.5}Bi_{0.5})(Mo_{0.5}W_{0.5})O_4$	580	Tetragonal Scheelite I41/A	26.3	10000		20	885
1919	$Bi_2Te_2W_3O_{16}$	700/6h	Monoclinic C2/c	26.3	2250	7.9		886
1920	$ZnZr(Nb_{1-x}Sb_x)_2O_8$ (x=0.08)	1250/4h	Monoclinic wolframite	26.3	89400		−57	887
1921	0.75$(Al_{1/2}Ta_{1/2})O_2$-0.25$(Ti_{1-x}Sn_x)O_2$ (x=0.05-0.3)		Tetragonal	26.3-30.0	63400-70700		<10	790
1922	$Nd_2Ba_{0.5}Ca_{0.5}ZnO_5$			26.4	6185		24	730
1923	$Ca(Er_{1/2}Ta_{1/2})O_3$	1600/4h	Complex perovskite Monoclinic $P2_1/n$	26.4	29600		−12	750
1924	$Ba[Ti_{1-x}(Zn_{1/2}W_{1/2})_x]O_3$ (x=0.7)	1420	Perovskite	26.4	22900		−2	695
1925	$LiBiW_2O_8$	650	Monoclinic	26.5	16400		70	888
1926	$Ca[(Li_{1/3}Nb_{2/3})_{0.8}Ti_{0.2}]O_{3-d}$+12 wt% LBS	920	Perovskite Orthorhombic	26.5	7000		−18	792
1927	0.2$(Al_{1/2}Ta_{1/2})O_2$-0.8$(Mg_{1/3}Ta_{2/3})O_2$	1450		26.5	103190		25	214

1928	$Ba_3NiNb_{2-x}Sb_xO_9$ (x=0.1)		Perovskite Cubic Pm3m	26.5	31110	5	−13	381
1929	$(1-x)La(Mg_{1/2}Ti_{1/2})O_3$-$xLa_{2/3}TiO_3$ (x=0.1)		Perovskite Monoclinic $P2_1/n$	26.5	30580	8.3		889
1930	$Ba[Ti_{1-x}(Ni_{1/2}W_{1/2})_x]O_3$ (x=0.45)	1425	Perovskite	26.5	30800		−3	616
1931	BaO-Sm_2O_3-$4TiO_2$+10 wt% B_2O_3	1100/2h	Composite	26.5	11800		−10	890
1932	$Ca(Tb_{1/2}Nb_{1/2})O_3$	1550/4h	Complex perovskite Monoclinic	26.5	34600		−13	763
1933	$Ba_3Ti_5Nb_6O_{28}$+5 wt% CuO	900/2h	Monoclinic $P2_1/c$	26.6	14100		21	461
1934	$Ba_8Ta_6(Ni_{1-x}Mg_x)O_{24}$ (x=0.5)		Hexagonal $P6_3cm$	26.6	86800		31	785
1935	$Ba_8Ta_6MgO_{24}$		Hexagonal $P6_3cm$	26.6	80900		18	785
1936	$Li_2CoTi_3O_8$+2 wt% B_2O_3	900	Cubic spinel $P4_332$	26.6	21300		2	891
1937	$Li_2(Mg_{0.94}Co_{0.06})Ti_3O_8$	1075	Cubic spinel $P4_332$	26.6	43600		4	855
1938	$0.8Mg_{0.95}Zn_{0.05})TiO_3$-$0.2Ca_{0.61}Nd_{0.26}TiO_3$+1 wt% B_2O_3	1175	Composite	26.6	54900	9	9	892
1939	$Ba_2Ti_9O_{20}$+20 wt% BaO-B_2O_3-ZnO glass	900	Composite	26.6	11950		−7	893
1940	TeO_2+15 wt% $SrTiO_3$	610	Composite	26.6	12400		−4	444
1941	$Ca_xZn_{1-x}Zr_{0.8}Sn_{0.2}Nb_2O_8$ (x=0.15)	1275	Mixture	26.6	61350		−21	894
1942	$Sr_6Ta_4ZrO_{18}$+3 wt% Bi_2O_3-B_2O_3	1625/2h	$A_6B_5O_{18}$ type perovskite	26.7	9100		−39	895
1943	$0.8LaAlO_3$-$0.2SrTiO_3$	1680	Composite	26.7	139000	10	−50	832
1944	$0.9TeO_2$-$SnTe_3O_8$	650	Mixture phase	26.7	10000		32	62
1945	TeO_2+20 wt% $SrTiO_3$	610	Composite	26.7	11400		31	444
1946	$Li_2Mg_{0.95}Co_{0.05}Ti_3O_8$	1170	Cubic Spinel	26.7	82000		−3	896
1947	$PbMoO_4$	650/2h	Tetragonal $I4_1/a$	26.7	42800	6.2	6	897
1948	$Sm(Mg_{0.5}Ti_{0.5})O_3$+10 mol% B_2O_3		Perovskite	26.8	20000		−18	898
1949	$Ca(Eu_{1/2}Ta_{1/2})O_3$	1600/4h	Complex perovskite Monoclinic $P2_1/n$	26.8	23600		−22	750
1950	$La(Mg_{2/3}Nb_{1/3})O_3$	1500/4h	Perovskite Rhombohedral	26.8	52000		−86	899
1951	$(Zr_{0.8}Sn_{0.2})TiO_4$+10 wt% BaO-B_2O_3-SiO_2-Li_2O-CuO	1000/8h	Composite	26.8	21900		−1	515
1952	$Li_2ZnTi_3O_8$+4 wt% TiO_2+1 wt% CBS glass	900/4h	Cubic+rutile	26.9	23600		−1	900

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
1953	$Ca(Cu_{1/3}Nb_{2/3})O_3$		Complex perovskite Orthorhombic	27.0	3300	–	–	609
1954	$Li_2Mg_{0.2}Zn_{0.8}Ti_3O_8$	1075/4h	Ternary spinel Cubic $P4_332$	27.0	66500		−50	858
1955	$Sr(Ga_{1/2}Ta_{1/2})O_3$	1500/3h	Perovskite	27.0	91000		–	901
1956	$La(Mg_{1/2}Ti_{1/2})O_3$ sol-gel	–	Monoclinic Perovskite $P2_1/n$	27.0	74500		−9	902
1957	$Ca(Y_{1/2}Ta_{1/2})O_3$	1600/4h	Perovskite Monoclinic $P2_1/n$	27.0	42300		−1	750
1958	$0.6Ca(Y_{1/2}Ta_{1/2})O_3$-0.4 $Ba(Y_{1/2}Ta_{1/2})O_3$	1600/4h	Perovskite	27.0	42000		−77	750
1959	$Sr(Er_{1/2}Ta_{1/2})O_3$	1600/4h	Pervoskite	27.0	22100		−88	861
1960	Ca_2AlNbO_6		Perovskite Monoclinic $P2_1/n$	27.0	14000	7.02	0	864
1961	$Ba(Mg_{1/3}Ta_{2/3})O_3$-$Ba(Zn_{1/3},Ta_{2/3})O_3$		Complex perovskite Trigonal P-3m1	27.0	150000	10		903
1962	BaO-TiO_2-WO_3 (N-35)+5 wt% ZnO-B_2O_3-SiO_2	1000	Composite	27.0	8400	7.0		786,862
1963	$Ca(Yb_{1/2}Nb_{1/2})O_3$	1500	Perovskite	27.0	7200	8.4	−30	590
1964	BaO-TiO_2-WO_3 (N-35):5 wt% PbO-Al_2O_3-SiO_2	1100	Composite	27.0	8400	6.1	–	786,862
1965	$Ba_8Ta_6Ni_{0.25}Zn_{0.75}O_{24}$		Trigonal $P6_3cm$	27.0	91730		35	785
1966	$BaTi_4O_9$+20 wt% B_2O_3-ZnO-La_2O_3	900/3h	Composite	27.0	20000		7	904
1967	$Nd(Co_{1/2}Ti_{1/2})O_3$	1440/4h	Monoclinic $P2_1/n$	27.0	140000	9	−46	905
1968	$Ba_6Ta_4TiO_{18}$	1625/2h		27.0	27500		45	895
1969	$CaZrO_3$		Perovskite Orthorhombic Pcmn	27.0	20800			906
1970	$Ba(Mn_{1/3}Ta_{2/3})O_3$	1600/air	Perovskite Trigonal P-3m1	27.0	15500		45	907
1971	$Ba(Mn_{1/3}Ta_{2/3})O_3$	1600/N_2	Perovskite Trigonal P-3m1	27.0	104000		45	907
1972	$0.3CaTiO_3$-$0.7Sm(Mg_{0.5}Ti_{0.5})O_3$	1550	Composite	27.0	11970	5.8	−29	865
1973	ZnO-TiO_2-2 wt% ZnO-B_2O_3-SiO_2	930/3h	Composite	27.0	20000		2	908
1974	BaO-$2CeO_2$-$4TiO_2$	1250	Composite	27.0	18560		9	909
1975	$Ba_5Nb_2Ta_2O_{15}$	1475	Trigonal P-3m1 perovskite	27.0	10600	4.7	22	851
1976	$Li_2ZnTi_3O_8$+2 wt% Li_2WO_4	860/4h	Composite	27.0	51100		−4	910
1977	$Nd_5Ti_4CrO_{17}$	1600/4h	Monoclinic	27.0	6400		−94	911

1978	$CaO\text{-}4NiO\text{-}Nb_2O_5\text{-}TiO_2$	1185	Composite	27.0	4000	4.6	−58	230
1979	$Ba_3NiNb_{2-x}Sb_xO_9$ (x=0.25)		Perovskite Cubic Pm3m	27.0	27370	5	−21	381
1980	$LaGaO_3$		Perovskite Orthorhombic Pnma	27.0	97000	5	−80	912
1981	$Ba(Zn_{1/2}Ta_{2/3})O_3$+1 mol% CeO_2	1525/6h, 1350/5h	Complex perovskite Trigonal P-3m1	27.0	123000		14	913
1982	$Ba[(Mg_{0.4}Zn_{0.6})Ta_{2/3}]O_3$	1600/4h	Perovskite Trigonal P-3m1	27.0	109900		4	883
1983	$0.7Ba(Mg_{1/3}Ta_{2/3})O_3$-$0.3Ba(Co_{1/3}Nb_{2/3})O_3$	1530/5h	Complex perovskite Trigonal P-3m1	27.0	172700		−1	914
1984	$Li_2Mg_{0.9}Zn_{0.1}Ti_3O_8$	1075/4h	Ternary spinel Cubic $P4_332$	27.0	62000		1	858
1985	$Li_2Zn_{0.95}Ca_{0.05}Ti_3O_8$	1075/4h	Ternary spinel Cubic $P4_332$	27.0	51100		−2	858
1986	$Bi(Sb_{0.6}Ta_{0.4})O_4$	1000	Monoclinic I2/c	27.0	35000		−15	915
1987	$Ca(Zr_xTi_{1-x})O_3$ (x=1)	1515/15h	Perovskite Orthorhombic Pcnmn	27.0	16500	5.35	−20	916
1988	$Ba_3LiTa_{3-x}Sb_xTi_5O_{21}$ (x=3)	1220	Hexagonal $P6_3/mcm$	27.0	29400		−25	917
1989	$Nd(Co_{1/2}Ti_{1/2})O_3$+1 wt% P_2O_5-ZnO-La_2O_3-Al_2O_3-Na_2O-MgO-Yb_2O_3 glass	1300	Monoclinic $P2_1/n$ Perovskite	27.0	64000		−29	918
1990	$Ba_{1/3}Pr_{2/3}Zn_{1/3}Ti_{2/3}O_3$		Not available	27.0	1000	5.07	−22	919
1991	$Ba_{1/2}Sr_{1/2}(Zn_{1/6}Co_{1/6}Ta_{2/9}Nb_{2/9}Sb_{2/9})O_3$	1550/6h	Perovskite	27.0	32100		−23	814
1992	$Ba_8NiTa_6O_{24}$		Hexagonal $P6_3cm$	27.0	81800			785
1993	$Ba_5Sr_2Ta_4ZrO_{21}$		$A_nB_{n-1}O_{3n}$ Hexagonal Perovskite	27.0	9800			920
1994	$Ba(La_{1/2}Ta_{1/2})O_3$	1450	Perovskite Cubic Fm3m	27.1	18000	8.7	51	590
1995	$Sr(La_{1/2}Ta_{1/2})O_3$	1500	Perovskite Cubic Fm3m	27.1	2600	8.4	−29	590
1996	$(Mg_{1/3}Ta_{2/3})O_2$	1550	Tetragonal $P4_2mmm$	27.1	95360		51	454
1997	$Li_2(Mg_{0.94}Zn_{0.06})Ti_3O_8$	1075	Cubic spinel $P4_332$	27.1	44800		2	855
1998	$Sr(Nd_{1/2}Ta_{1/2})O_3$	1500	Perovskite ubic Fm3m	27.1	25000	8.3	−68	590
1999	$Sr(Er_{0.5}Ta_{0.5})O_3$+0.5 wt% Nb_2O_5	1600/4h	Complex perovskite Tetragonal	27.1	22100		−77	859
2000	$Mg_{0.5}Zn_{0.5}ZrNb_2O_8$	1260	Monoclinic P2/c	27.1	91100		−18	921
2001	$Ca(Gd_{1/2}Ta_{1/2})O_3$	1600/4h	Complex perovskite Monoclinic	27.2	26000		−16	750
2002	$Nd(Co_{1/2}Ti_{1/2})O_3$+0.75 wt% B_2O_3	1320/4h	Perovskite Monoclinic $P2_1/n$	27.2	153000	9	0	922
2003	$Ba_3LiSb_3Ti_5O_{21}$	1220	Hexagonal $P6_3/mcm$	27.2	29400		−25	923

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
2004	$Li_2MgTi_3O_8$	1075	Ternary spinel Cubic $P4_332$	27.2	42000		3	847
2005	$Bi_3FeMo_2O_{12}$	845/2h	Monoclnic sheelite C2/c	27.2	14500		−80	924
2006	$Ba_2Ti_9O_{20}$+1 wt% ZnO-B_2O_3	940/2h	Monoclinic P-1	27.3	8300	7.2	3	925
2007	$MgTa_{1.4}Nb_{0.6}O_6$	1450	Columbite Tetragonal $P4_2/mmm$	27.3	40800		−3	926
2008	$Ba_8Ta_6(Ni_{1-x}Zn_x)O_{24}$ (x=0.5)		Hexagonal $P6_3cm$	27.4	83800		36	785
2009	$Nd(Co_{1/2}Ti_{1/2})O_3$+0.5 wt% ZnO	1350	Perovskite Monoclinic $P2_1/n$	27.4	147000	8	−30	927
2010	$ZnZr_{0.8}Sn_{0.2}Nb_2O_8$	1275/6h	Monoclinic P2/c	27.4	76800	7	−55	928
2011	TeO_2+10 wt% $SrTiO_3$		Composite	27.5	13100		−46	444
2012	$Ba_8Ta_6NiO_{24}$		Hexagonal $P6_3cm$	27.5	81750		33	785
2013	$Sr(La_{1/2}Nb_{1/2})O_3$	1500	Perovskite Cubic Fm3m	27.5	2000	8.3	−33	590
2014	$Sr(Zn_{1/2}W_{1/2})O_3$	1360	Perovskite Cubic Fm3m	27.5	51000	7.0	−45	528
2015	0.8$La(Mg_{1/2}Ti_{1/2})O_3$-0.2$La_{2/3}TiO_3$	1500/2h	Composite	27.5	16600	7.9		929
2016	$Ba(Mg_{1/3}Nb_{2/3})O_3$+B_2O_3	900	Perovskite Trigonal P-3m1	27.5	8500		27	930
2017	(1-x)$La(Mg_{1/2}Ti_{1/2})O_3$-x$La_{2/3}TiO_3$ (x=0.2)		Perovskite Monoclinic $P2_1/n$	27.5	16600	7.89		889
2018	$Sr(Y_{0.5}Ta_{0.5})O_3$+0.5 wt% Nb_2O_5	1600/4h	Complex perovskite Rhombohedral R3m	27.5	54300		−77	859
2019	90 wt%(Zr,Sn)TiO_4+10 wt% Li_2O-B_2O_3-SiO_2	875	Composite	27.5	9000		14	592
2020	$ZnTiO_3$-0.25TiO_2	925	Composite	27.5	14000		−20	931
2021	$Ba_8Ta_6(Ni_{1-x}Zn_x)O_{24}$ (x=0.75)		Hexagonal $P6_3mc$	27.6	91700		37	785
2022	$Ca[(Li_{1/3}Ta_{2/3})_{.9-}Ti_{0.1}]O_{3-d}$+3 wt% B_2O_3	1000/4h	Perovskite	27.6	9800	10.2	–	765
2023	$La(Mg_{1/2}Ti_{1/2})O_3$	1600	Monoclinic perovskite $P2_1/n$	27.6	114300	7.1	−81	932,933
2024	$(Ca_2Mg_3)Nb_2(Ti_{0.75}Zr_{0.25})O_{12}$	1275		27.6	7600		−36	799
2025	$Li_2Zn_xCo_{1-x}Ti_3O_8$ (x=0.4)	1050/2h	Cubic spinel $P4_332$	27.7	57100		1	934
2026	$Li_2Zn_{0.9}Ca_{0.1}Ti_3O_8$	1075/4h	Ternary spinel Cubic $P4_332$	27.7	44500		11	858
2027	$Sr(Sm_{1/2}Ta_{1/2})O_3$	1500	Perovskite	27.7	59000	8.5	−63	590
2028	$Sr(Ho_{0.5}Ta_{0.5})O_3$+0.5 wt% Nb_2O_5	1600/4h	Complex perovskite Tetragonal	27.7	38800		−75	859
2029	$Ba[(Mg_{0.4}Zn_{0.6})Ta_{2/3}]O_3$	1575	Complex perovskite Trigonal P-3m1	27.7	109900	4.6	6.3	883

2030	$Ba_6Ta_4ZrO_{18}$+2 wt% Bi_2O_3-B_2O_3	1625/2h	$A_6B_5O_{18}$ type perovskite	27.8	41000		5	895
2031	$Li_2ZnTi_3O_8$+2 wt% Bi_2O_3	950	Cubic $P4_332$	27.8	36400			935
2032	$Ba_5SrTa_4ZrO_{18}$+2 wt% Bi_2O_3-B_2O_3	1625/2h	$A_6B_5O_{18}$ type perovskite	27.8	18500		37	895
2033	$Sm_{0.78}Y_{0.22}TiNbO_6$	1400	Orthorhombic Pbnm	27.9	2300		11	564
2034	$MgNb_2O_6$	1450	Columbite Orthorhombic Pcan	27.9	91500			926
2035	$MgTa_{1.5}Nb_{0.5}O_6$	1450	Columbite Tetragonal $P4_2/mmm$	27.9	33100		−1	926
2036	0.8($Mg_{0.95}Co_{0.05}$)TiO_3-0.2($Ca_{0.6}La_{0.8/3}TiO_3$+1 wt% ZnO	1250	Mixed phases	27.9	36000	8	14	936
2037	$Ba_8Ta_6(Ni_{1-x}Mg_x)O_{24}$ (x=0.25)		Hexagonal $P6_3cm$	27.9	81500		32	785
2038	$Sr_{1-x}Ca_x(Ga_{1/2}Ta_{1/2})O_3$		Perovskite	26-28	18000-90000	8	−50 to−97	937
2039	$Zn_{0.9}Co_{0.1}ZrNb_2O_8$	1240/4h	Monoclinic P2/c	27.9	68600	6.95	−62	938
2040	$BaTi_4O_9$-10 mol% BaO-ZnO-B_2O_3 glass	925	Composite	28-33	20000	6.6		939
2041	$Nd(Mg_{1/2}Ti_{1/2})O_3$	1650/2h	Monoclinic perovskite $P2_1/n$	28.0	36900	10	−49	702
2042	$Ba_{1/3}Nd_{2/3}Zn_{1/3}Ti_{2/3}O_3$			28.0	1500	5.03	−19	919
2043	($Zn_{0.9}Mg_{0.1}$)TiO_3+1 wt% V_2O_5	950/4h	Trigonal R-3	28.0	67200		−8	940
2044	$Ba_4LiNb_{3-x}Ta_xO_{12}$ (x=3)	1450	Hexagonal perovskite $P6_3mc$	28.0	103600		25	941
2045	0.47$BaTe_4O_9$-0.53$TiTe_3O_8$	560	Composite	28.0	12000	10	4	942
2046	$Ca(Zr_xTi_{1-x})O_3$ (x=0.8)	1470/15h	Perovskite Cubic Pm3m	28.0	3500	4.35	170	916
2047	$Ba(Tb_{1/2}Ta_{1/2})O_3$	1625	Perovskite	28.0	28200		−38	943
2048	$Ca(Mg_{1/3}Nb_{2/3})O_3$		Complex perovskite Orthorhombic	28.0	58000	–	−48	609,944
2049	$Sr(Zn_{1/3}Ta_{2/3})O_3$	1500	Perovskite Cubic Pm3m	28.0	21700		−54	701
2050	$Ba(Zn_{1/3}Ta_{2/3})O_3$	1350/120h	Complex perovskite Trigonal P-3m1	28.0	168000		1	903
2051	0.6$Ca(Yb_{1/2}Ta_{1/2})O_3$-0.4 $Ba(Yb_{1/2}Ta_{1/2})O_3$	1600/4h	Perovskite	28.0	48000		2	750
2052	$Ca(Yb_{1/2}Ta_{1/2})O_3$+4 mol% $CaTiO_3$	1600/4h	Perovskite	28.0	41000		−2	750

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
2053	$Ba[Zr_{0.0645}\ Ni_{0.1625}Zn_{0.816}Ta_{1.957}]O_3$	1520/48h	Perovskite Trigonal P-3m1	28.0	136770		−3	945
2054	$Ba(Zn_{1/3}Ta_{2/3})O_3$+1 mol% Cr_2O_3	1525/6h	Complex perovskite Hexagonal P-3m1	28.0	125500		−2	913
2055	$Ca(Ho_{1/2}Ta_{1/2})O_3$	1600/4h	Perovskite Monoclinic $P2_1/n$	28.0	23700		−8	750
2056	$Sr(Dy_{1/2}Ta_{1/2})O_3$	1600/4h	Perovskite	28.0	34200		−73	861
2057	$Sr(Ho_{1/2}Ta_{1/2})O_3$	1600/4h	Perovskite	28.0	38800		−75	861
2058	$Sr(Y_{1/2}Ta_{1/2})O_3$	1600/4h	Perovskite Monoclinic $P2_1/n$	28.0	54300		−77	861
2059	$Ca(Ca_{1/3}Nb_{2/3})O_3$		Perovskite Monoclinic	28.0	17000	–	−22	609
2060	$Zn(Nb_{0.35}Ta_{0.65})_2O_6$	1300	Columbite Orthorhombic Pbcn	28.0	50000		0	946
2061	$0.5Ca_2AlNbO_6$-$0.5Ca_3Nb_2O_8$		Mixture phases	28.0	8900	6.86	36	864
2062	$MgTa_2O_6$+0.5 wt% CuO	1400	Trirutile structure Tetragonal $P4_2/mmm$	28.0	58000		18	947
2063	$Zn_{0.4}Co_{0.6}TiO_3$	1200	Spinel+rutile	28.0	70000			948
2064	$Pr(Mg_{1/2}Ti_{1/2})O_3$	1650/2h	Perovskite	28.0	27800	10	−17	702
2065	$Ba_5Ta_4O_{15}(A_nB_{n-1}O_{3n})$	1550	Trigonal P-3m1 perovskite	28.0	31600	5.55	12	325,851
2066	3CaO-2CoO-Ta_2O_5-TiO_2	1400	Mixture	28.0	19500	4.8	−14	230
2067	$0.75(Al_{1/2}Ta_{1/2}O_2)$-$0.25(Ti_{0.85}Sn_{0.15})O_2$	1450/3h	Composite	28.0	68000		0	949
2068	$(1-x)LaMg_{1/2}Ti_{1/2}O_3$-$xLa_{2/3}TiO_3$ (x=0.1)		Perovskite	28.0	56000	6.6	−66	950
2069	$(1-x)Sr(Li_{1/4}Nb_{3/4})O_3$-$xSr(Li_{2/3}W_{3/5})O_3$ (x=0.283)	1450	Provskite Monoclinic $P2_1/c$	28.0	23800	9.1	30	951
2070	$Ba_8Li_2Ta_6O_{24}$		Hexagonal $P6_3mmc$	28.0	103600		−29	952
2071	$MgZr_{1.32}Nb_2O_{8.64}$	1320/6h	Wolframite	28.0	68600		1	953
2072	$La_5AlTi_3O_{15}$	1600	Hexagonal perovskite	28.1	28600	3.4	−39	954
2073	$0.09[0.5ZnNb_2O_6$-$0.5Zn_3Nb_2O_8]$-*0.91*$ZnTa_2O_6$+5 wt% ZBS	900	Composite	28.1	32800		−8	955
2074	$Ba(Zn_{1/2}W_{1/2})O_3$	1340	Perovskite Cubic Fm3m	28.1	22700	8		432
2075	Al_2O_3-TiO_2-Ta_2O_5	1575	Composite	28.1	1000		20	583
2076	$SrHfO_3$	1750	Cubic Pm3m	28.1	33500	9.3	−63	850
2077	$Ba(Ti_{0.5}Mn_{0.5})O_3$+5 wt% Li_2CO_3	1200	Perovskite Hexagonal	28.1	5300		35	956
2078	$Li_2Cu_{0.2}Mg_{0.8}Ti_3O_8$	950	Cubic $P4_332$	28.1	34300		9	957

2079	$Ba[Ti_{1-x}(Zn_{1/2}W_{1/2})_x]O_3$ (x=1)	1380	Cubic perovskite $Fm3^{-}m$	28.2	15200		−16	695
2080	$Ba_{10}Mg_{0.25}Ta_{7.9}O_{30}$	1600/12h	Hexagonal $P6_3mc$	28.2	33500		29	958
2081	$Sr(Dy_{0.5}Ta_{0.5})O_3$+0.5 wt% Nb_2O_5	1600/4h	Complex perovskite tetragonal	28.2	34200		−73	859
2082	$Ca(Ho_{1/2}Ta_{1/2})O_3$	1600/4h	Complex perovskite Monoclinic $P2_1/n$	28.2	23700		−8	750
2083	$BaTa_2V_2O_{11}$	870	Rhombohedral R-3m	28.2	41950		91	336
2084	$La(Zn_{1/2}Ti_{1/2})O_3$ (sol gel)		Perovskite	28.3	66500			959
2085	$La_2Ti_2SiO_9$	1325	Monoclinic C2/m	28.3	29500		23	960
2086	$Ba(Zn_{1/3}Ta_{2/3})O_3$+1 wt% V_2O_3	1600	Perovskite Trigonal P-3m1	28.4	236000			961
2087	$Li_2Mg_{0.95}Ca_{0.05}Ti_3O_8$	1075/4h	Ternary spinel cubic $P4_332$	28.4	40000		14	858
2088	$Ca[(Li_{1/3}Nb_{2/3})_{0.75}Ti_{0.25}]O_{3-d}$+12 wt% LMZBS glass	920/4h	Perovskite	28.4	11000	4.8	−3	792
2089	$Ca[(Li_{1/3}Ta_{2/3})_{.8}Ti_{0.2}]O_{3-d}$+3 wt% B_2O_3	1050	Perovskite	28.4	12900	9.9	−15	765
2090	$Sr_6Ta_4ZrO_{18}$+3 wt% Bi_2O_3-B_2O_3 glass	1625/2h		28.4	9100		−39	895
2091	$ZnZrNb_2O_8$+3 wt% $BaCu(B_2O_5)$	950/4h	Monoclinic	28.4	56700		−53	962
2092	$Ba_3MgNb_{2-x}Sb_xO_9$ (x=0.125)		Perovskite Trigonal P-3m1	28.5	101300	4.7	14	381
2093	$0.8(Mg_{0.5}Zn_{0.4})_{0.95}Co_{0.05}TiO_3$-$0.2Ca_{0.61}Nd_{0.26}TiO_3$	1250	Mixed phases	28.6	80600		4	963
2094	TeO_2+10 wt% $CaTiO_3$	645	Composite	28.7	15600		−3	444
2095	$0.6[0.7ZnNb_2O_6$-$0.3Zn_3Nb_2O_8]$-$0.4TiTe_3O_8$	670	Composite	28.7	5700		3	964
2096	$(Mg_{0.95}Ni_{0.05})Ta_2O_6$	1525	Tetragonal $P4_2/mmm$	28.7	88300		45	965
2097	$(Pb_{1-3x/2}La_x)(Mg_{1/2}W_{1/2})O_3$ (x=0.56)	1200	Perovskite Orthorhombic	28.7	18100		−6	966
2098	$Li_2Mg_{0.96}Zn_{0.04}Ti_3O_8$	1200	Cubic Spinal	28.7	151200		−3	896
2099	$Sr(Tb_{0.5}Ta_{0.5})O_3$+0.5 wt% Nb_2O_5	1600/4h	Complex perovskite Tetragonal	28.8	46200		−70	859
2100	$Mg_{0.3}Co_{0.7}Ta_2O_6$	1500/2h	Tetragonal $P4_2/mmm$	28.8	22900		34	967
2101	$Li_2CoTi_3O_8$	1025	Cubic spinel $P4_332$	28.9	52600		7	968
2102	$Ba_8Ta_6ZnO_{24}$		Hexagonal $P6_3cm$	28.9	85000		40	785
2103	$SmTaTi_{0.6}Zr_{0.4}O_6$			28.9	38320		−12	671
2104	$0.7LaAlO_3$-$0.3SrTiO_3$	1680	Composite	28.9	120000	9.9	−44	832
2105	$Zn_{0.95}Ni_{0.05}ZrNb_2O_8$			29.0	83600		−49	969

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
2106	$Ca(Co_{1/3}Nb_{2/3})O_3$		Complex perovskite Orthorhombic	29.0	6200	–	−65	609
2107	$BaO\text{-}TiO_2\text{-}WO_3$ (N-35): $ZnO\text{-}B_2O_3$	1100	Composite	29.0	7000	5.8	–	786,862
2108	$CoTa_2O_6$	1500	Trirutile Tetragonal $P4_2/mmm$	29.0	2300		23	600
2109	$La(Mg_{1/2}Ti_{1/2})O_3$	1650/2h	Perovskite Monoclinic $P2_1/n$	29.0	114000		−81	933
2110	$Ba(Zn_{1/2}Ta_{2/3})O_3$+0.3 mol% Ta_2O_5	1620/10h	Complex perovskite Trigonal P-3m1	29.0	152000			162
2111	0.95 $Ba(Zn_{1/2}Ta_{2/3})O_3\text{-}0.05Sr(Ga_{1/2}Ta_{1/2})O_3$	1550/2h, 1450/24h	Perovskite	29.0	162000		0	970,971
2112	$Ba_3(Zr_{0.0645}Zn_{0.816}Ni_{0.1625}Ta_{1.957})O_9$	1510/24h	Complex perovskite Trigonal P-3m1	29.0	126860		−2	972
2113	$Sr(Tb_{1/2}Ta_{1/2})O_3$	1600/4h	Perovskite	29.0	34200		−70	861
2114	$3CaO\text{-}2NiO\text{-}Ta_2O_5\text{-}TiO_2$	1500	Composite	29.0	18800	4.9	−33	230
2115	$2CaO\text{-}3CoO\text{-}Ta_2O_5\text{-}TiO_2$	1175	Composite	29.0	18500	4.9	−28	230
2116	$La_{10}MgTi_9O_{34}$		Perovskite slab series	29.0	13000	5.9	−22	950
2117	$BaTiTe_3O_9$	650		29.0	1700	7.6	−372	973
2118	$(1\text{-}x)Ca(Li_{1/4}Nb_{3/4})O_3\text{-}xCa(Li_{2/3}W_{3/5})O_3$ (x=0.333)	1150	Provskite Trigonal $P2_1/c$	29.0	15700	9.7	−35	951
2119	$(Sr_{2/3}La_{1/3})(Li_{1/3}Nb_{2/3})O_3$	1300	Not available	29.0	6300	8.9	−76	824
2120	CeO_2+0.06$CaTiO_3$	1650/2h	Cubic flurite Fm3m	29.0	25000		0	525
2121	$La(Mg_{1-x}Zn_x)_{1/2}Ti_{1/2}O_3$ (x=0.3)	1475/4h	Perovskite Cubic Pa3	29.0	74000		−63	974
2122	$Sr_{4-m}La_mTi_{m-1}Ta_{4-m}O_{12}$ (m=1)	1560	Cation deficient Hexagonal perovskite	29.0	16050		−43	975
2123	$Mg(Nb_{0.7}Ta_{1.3})O_6$		Columbite	29.0	67800		1	976
2124	$Ba_8Ga_{0.8}Ta_{5.92}O_{24}$	1450/24h	Hexagonal $P6_3cm$	29.0	29000		11	952
2125	$Ba_8CoTa_6O_{24}$		Hexagonal $P6_3cm$	29.0	69400			952
2126	$Ba_8CuTa_6O_{24}$		Hexagonal $P6_3cm$	29.0	8600			952
2127	$0.5CeO_2\text{-}0.25MnO\text{-}0.25TiO_2$:0.4 Sb_2O_3	1200	Composite	29.1	7000	4.9221	−1	488
2128	$Ba(Zn_{1/2}W_{1/2})O_3$	1330	Perovskite cubic Fm3m	29.1	36000	6.8	−31	528
2129	$La(Mg_{1-x}Co_x)_{1/2}TiO_3$ (x=1)+1 wt% ZnO	1375/4h	Perovskite	29.1	80000		−59	977

2130	$BaHfO_3$	1750	Cubic perovskite Pm3m	29.1	5400	8.85	111	850
2131	$Zn_{0.95}Mg_{0.05}ZrNb_2O_8$			29.1	81200			969
2132	$Ca_2Mg_3(Nb_{1.75}Sb_{0.25})TiO_{12}$	1250	Mixture phases	29.2	18800		−22	843
2133	$Pr_2Ti_2SiO_9$	1325	Monoclinic C2/m	29.2	33700		20	960
2134	$0.9La(Mg_{1/3}Ti_{1/3})O_3$-$0.1SrTiO_3$		Perovskite Pbnm	29.2	14500	7.33		978
2135	$0.9Nd(Co_{1/2}Ti_{1/2})O_3$-$0.1SrTiO_3$	1440/4h	Perovskite mixtures	29.3	80900		0	979
2136	$Ba_6Ta_4TiO_{18}$	1550/2h	Not available	29.3	27500		45	895
2137	$(1-x)La(Mg_{1/2}Ti_{1/2})O_3$-$xLa_{2/3}TiO_3$ (x=0.3)		Perovskite Orthorhombic Pnma	29.3	6500	8.3		889
2138	$Sm(Mg_{0.5}Ti_{0.5})O_3$+10 mol% Bi_2O_3	1300	Composite	29.3	26300	8.84	−33	898
2139	$Mg_{0.7}Co_{0.3}Ta_2O_6$	1500/2h	Tetragonal $P4_2/mmm$	29.3	45700		40	967
2140	$SrYb_{1/2}Nb_{1/2})O_3$+0.2 wt% B_2O_3	1350/4h	Complex perovskite Orthorhombic	29.3	30600		−75	823
2141	$Ca[(Li_{1/3}Nb_{2/3})_{0.95}Zr_{0.15}]O_{3+d}$+5 wt% Li_2O-B_2O_3-SiO_2-CaO-Al_2O_3 glass	940	Perovskite	29.4	5400		−25	980
2142	$Sr(Yb_{1/2}Nb_{1/2})O_3$	1500	Perovskite Hexagonal	29.4	50000	8.1	−72	590
2143	$0.8(Al_{1/2}Ta_{1/2})O_2$-$0.2TiO_2$	1450/3h	Tetragonal	29.4	75470		0	981
2144	$Ca[(Li_{1/3}Ta_{2/3})_{.85}Ti_{0.15}]O_{3-d}$+3 wt% B_2O_3	1050/4h	Perovskite	29.4	20700	10.47	−57	765
2145	$Ba_6Ti_{1-x}Sn_xNb_4O_{18}$ (x=1)	1530	Trigonal R-3m	29.5	28500	6.06	0	982
2146	$Sr(Gd_{0.5}Ta_{0.5})O_3$+0.5 wt% Nb_2O_5	1600/4h	Complex perovskite Tetragonal	29.5	4000		−66	859
2147	$BaZn_{1.98}Cu_{0.02}Ti_4O_{11}$	1190/2h	Orthorhombic Pbcn	29.5	51400		−34	983
2148	$0.85(Mg_{0.7}Zn_{0.3})_{0.95}Co_{0.05}TiO_3$-$0.15Ca_{0.8}Sm_{0.4/3}TiO_3$		Composite	29.5	65000	9	1	984
2149	$ZnZrNb_2O_8$			29.5	61000		−53	969
2150	$Pr_xY_{1-x}TiTaO_6$ (x=0.23)	1600		29.6	41000		5	985
2151	$Zn_{0.95}Co_{0.05}ZrNb_2O_8$			29.6	60500			969
2152	$0.94CoNb_2O_6$-$0.06TiO_2$	1150	Composite	29.6	20300		4	545
2153	$0.78ZnNb_2O_6$-$0.22TiO_2$	1200	Composite	29.6	27700		22	545
2154	$Ca[Li_{1/3}Nb_{2/3}]O_3$	1150/3h	Perovskite	29.6	40000		−21	752
2155	$Ca(In_{1/2}Nb_{1/2})O_3$	1550/4h	Complex perovskite Orthorhombic	29.6	37900		−33	763
2156	$La(Mg_{1/2}Ti_{1/2})O_3$+1 wt% CuO	1450	Perovskite $P2_1/n$	29.6	33800		−68	986

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
2157	$Sr(Nd_{1/2}Nb_{1/2})O_3$	1500	Perovskite	29.7	2500	8.1	−32	590
2158	$SmTaTi_{0.5}Zr_{0.5}O_6$			29.7	32173		−21	671
2159	$Ba_{10}Co_{0.25}Ta_{7.9}O_{30}$	1600/24h	Hexagonal $P6_3mc$	29.7	36700		29	865
2160	$0.23BaWO_4$-$0.77Ba_5Nb_4O_{15}$	1100	Composite	29.7	44600		28	485
2161	$(1-y)Li_{2.02}Ti_{0.92}Nb_{0.06}O_3$ (y=0.4)	1070		29.8	10000		24	722
2162	$Mg_{0.93}Co_{0.07}Ta_2O_6$	1500/2h	Tetragonal $P4_2/mmm$	29.8	68200		42	967
2163	$Ca[(Li_{1/3}Nb_{2/3})_{0.9}Zr_{0.1}]O_{3-d}$	1150	Perovskite	29.8	36300		−5	987
2164	$Ba[Ti_{1-x}(Ni_{1/2}W_{1/2})_x]O_3$ (x=0.4)	1425	Perovskite Hexagonal $P6_3/mmc$	29.8	26700		7	695
2165	$0.9La(Mg_{1/2}Ti_{1/2})O_3$-$0.1CaTiO_3$	1600	Perovskite $P2_1/n$	29.8	16700	6.9	−70	932
2166	$La(Co_{1/2}Ti_{1/2})O_3$+0.25 wt% CuO	1380	Orthorhombic Pnm_{21}	29.8	64000	8	−56	988
2167	$NdNbO_4$	1150	Fergusonite	29.8	49000		53	989
2168	$Zn_{0.95}Mn_{0.05}ZrNb_2O_8$			29.8	59800		−40	969
2169	$Ba_3YNb_3O_{12}$	1450		29.9	39500		24	990
2170	$Ca[(Li_{1/3}Nb_{2/3})_{1-x}Zr_x]O_3$ (x=0.05)	1150	Perovskite orthorombic	29.9	46300		−20	733
2171	$La(Mg_{1-x}Zn_x)_{1/2}Ti_{1/2}O_3$+1 wt% B_2O_3	1475	Perovskite Cubic Pa3	30.0	74000		−63	991
2172	$7Bi_2O_3$-MoO_3	820	Composite	30.0	1900		−20	494
2173	$Ca(Dy_{1/2}Ta_{1/2})O_3$	1600/4h	Complex perovskite Monoclinic $P2_1/n$	30.0	26500		−6	750
2174	$ZnZrNb_2O_8$	950	Monoclinic P2/c	30.0	61000		−52	992
2175	$Ba(Yb_{1/2}Nb_{1/2})O_3$	1700	Complex perovskite Orthorhombic	30.0	16500	8.7	118	590
2176	Nb_2O_5-$Zn_{0.95}Mg_{0.05}TiO_3$+0.25TiO_2+5 wt% Bi_2O_3	960	Composite	30.0	12000		−12	993
2177	$Ba_4LiNb_{3-x}Ta_xO_{12}$ (x=2)	1400	Hexagonal perovskite	30.0	37500		34	941
2178	$Sr(Al_{1/2}Nb_{1/2})O_3$+0.2 wt% B_2O_3	1350/4h	Complex perovskite	30.0	22500		−2	823
2179	$La_4Ba_2Ti_5O_{18}$+B_2O_3		Hexagonal R	30.0	20000		55	994
2180	$Ba(Zn,Ta)O_3$-$Ba(Zn,Nb)O_3$		Complex perovskite Trigonal P-3m1	30.0	164000	12	0	903
2181	$Ba(Ca_{1/3}Ta_{2/3})O_3$		Perovskite Hexagonal	30.0	27400	7	145	701
2182	$BaNb_2O_6$	1300	Orthorhombic $C222_1$	30.0	43000		−45	995
2183	$Pb_{0.5}Ca_{0.5}(Al_{1/2}Nb_{1/2})O_3$		Perovskite	30.0	1500	5.1	−23	996

2184	$CaZrO_3$		Perovskite Pcmn Orthorhombic	30.0	26400	11	−27	997,998
2185	$SrZrO_3$		Perovskite Orthorhombic Pcmn	30.0	13600	11	−67	997,998
2186	$La(Co_{1/2}Ti_{1/2})O_3$	1440/6h	Perovskite Orthorhombic $Pnm2_1$	30.0	67000	10	−64	819
2187	$Ba_8Li_2Nb_2Ta_4O_{24}$		Hexagonal $P6_3mmc$	30.0	37500			952
2188	$Ca[(Li_{1/3}Nb_{2/3})_{0.9}\ Zr_{0.1}]O_{3-\delta}$	1150	Perovskite	30.0	36300		−5	999
2189	$(1-x)Sr(Li_{1/4}Nb_{3/4})O_3$-$xSr(Li_{2/5}W_{3/5})O_3$ (x=0.385)	1450	Provskite monoclinic $P2_1/c$	30.0	21200		−33	951
2190	$(1-x)Ca(Li_{1/4}Nb_{3/4})O_3$-$xCa(Li_{2/5}W_{3/5})O_3$ (x=0.238)	1150	Perovskite	30.0	22700		−33	951
2191	$ZnTiO_3$+0.25TiO_2+1 wt% B_2O_3	875/4h	Mixture	30.0	56000		10	1000
2192	$Sm_{0.8}Y_{0.2}TiNbO_6$	1400	Orthorhombic Pbnm	30.0	11000		17	564
2193	$Ba_5Ta_4O_{15}$	1550/40h	Hexagonal perovskite	30.0	31600		12	325
2194	$Bi_2ZnNb_2O_9$+$ZnNb_2O_6$+3 wt% PbO-Bi_2O_3-B_2O_3-ZnO-TiO_2 glass	900	Composite	30.0	3500	6		1001
2195	$Ba_2Ti_9O_{20}$+9 wt% B_2O_3	1050/2h	Monoclinic $P2_1/m$	30.0	13700		6	1002
2196	$Ba(Zn_{1/3}Ta_{2/3})O_3$+1 mol% Mn	1550	Perovskite Trigonal P-3m1	30.0	145000		0	787
2197	$Ba_3[Zr_{0.09}Ni_{0.125}Zn_{0.845}Ta_{1.94}]O_3$	1520/48h	Perovskite Trigonal P-3m1	30.0	138710		−1	945
2198	$Ba(Zr_{0.05}Zn_{0.32}Ta_{0.63})O_3$	1500/4h	Complex perovskite Trigonal P-3m1	30.0	148000		8	1003
2199	0.15$TiTe_3O_8$-0.85TeO_2	700	Composite	30.0	22000	5	0	586
2200	BaO-CeO_2-TiO_2+1.5 wt% CuO	1050	Composite	30.0	32000		−11	366
2201	$Ca_{1-x}Nd_{2x/3})TiO_3$+3ZnO-2B_2O_3 glass (20-40 mol%)	880	Perovskite Tetragonal	30-60	200-5500		20-60	1004
2202	3CaO-2MgO-Ta_2O_5-TiO_2	1550	Composite	30.0	185000	4.6	−24	230
2203	$La(Zn_{1/2}Ti_{1/2})O_3$sol-gel	1350	Perovskite Orthorhombic	30.0	60000		−71	1005
2204	$Ca(Yb_{1/2}Nb_{1/2})O_3$	1550/4h	Complex perovskite Orhorhombic	30.0	32500		−25	763
2205	$Sr(Eu_{1/2}Ta_{1/2})O_3$	1600/4h	Complex perovskite	30.0	45500		−43	861
2206	$Sr(Gd_{1/2}Ta_{1/2})O_3$	1600/4h	Complex perovskite	30.0	4000		−66	861
2207	$Ca(Dy_{1/2}Ta_{1/2})O_3$	1600/4h	Complex perovskite	30.0	26500		−6	750
2208	$BaZn_2Ti_4O_{11}$	1200	Orthorhombic Pbcn	30.0	68000		−30	1006

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
2209	$Ba_5SrTa_4ZrO_{18}$+2 wt% Bi_2O_3-B_2O_3 glass	1525/4h	Trigonal R-3m	30.0	18500		37	895
2210	$BaZn_{1.95}Ti_4O_{10.95}$	1200	Orthorhombic Pbcn	30.0	110000			1006
2211	$La(Co_{1/2}Ti_{1/2})O_3$+0.25 wt% B_2O_3	1350/6h	Perovskite	30.0	64600	8	−48	1007
2212	(1-x)$Sr(Li_{1/4}Nb_{3/4})O_3$-x$Sr(Li_{2/5}W_{3/5})O_3$ (x=0.385)	1450	Perovskite	30.0	21200	9.2	−33	951
2213	$(Ca_{2/3}La_{1/3})(Li_{1/3}Nb_{2/3})O_3$	1250	Monoclinic $P2_1/c$	30.0	26500	8.7	−26	824
2214	(1-x)$CaTiO_3$-x$Sm(Mg_{1/2}Ti_{1/2})O_3$ (x=0.8)		Orthorhombic Pnm1 Perovskite	30.0	13000		−20	1008
2215	$BaZn_{2-x}Ti_4O_{11-x}$ (x=0-0.1)	1250/4h	Orthorhombic Pbcn	30.0	83000		−30	1006
2216	$Ba_{10}Co_{0.25}Ta_{7.9}O_{30}$	1550	$P6_3mc$	30.0	36700	3.78	29	958
2217	$Sr(Eu_{0.5}Ta_{0.5})O_3$+0.5 wt% Nb_2O_5	1600/4h	Complex perovskite Tetragonal	30.0	45500		−63	859
2218	$Nd_5Ti_4FeO_{17}$	1400	Monoclinic P21/b	30.0	7400		−104	911
2219	$Ba_6Ta_4ZrO_{18}$+2 wt% Bi_2O_3-B_2O_3 glass	1625/2h		30.1	41000		5	895
2220	La_2O_3-WO_3-TiO_2	1350	Multiphase	30.1	9225	5.8	−17	400
2221	$Nd_2Ti_2SiO_9$	1300	Monoclinic C2/m	30.1	19600		10	960
2222	TeO_2+15 wt% $CaTiO_3$		Composite	30.1	21400		29	444
2223	$MgTa_2O_6$ (Sol-gel)	1200	Columbite Tetragonal $P4_2/mmm$	30.1	57300		29	1009
2224	$Ca[(Li_{1/3}Nb_{2/3})_{1-x}Zr_x]O_3$ (x=0.1)	1150	Perovskite Orthorhombic	30.1	36000		−5	733
2225	$0.8Sm(Mg_{0.5}Ti_{0.5})O_3$-$0.2Ca_{0.8}Sr_{0.2}TiO_3$	1550/3h	Perovskite	30.1	115000		9	1010
2226	$LiBiW_2O_8$+30 mol% TiO_2	700/2h	Composite	30.2	13000		−9	888
2227	$La(Co_{1/2}Ti_{1/2})O_3$+0.75 wt% ZnO	1320	Perovskite	30.2	73000	8	−35	1011
2228	MWF-38+10 wt% Li_2O-B_2O_3-SiO_2-(56.92:37.59:5.49)	875	Composite	30.2	9500		3	510
2229	$BaLi_2Ti_6O_{14}$+0.5 wt% $BaCu(B_3O_5)$	920	Orthorhombic Cmca	30.2	28400		−18	1012
2230	$MgTa_2O_6$	1550	Tetragonal $P4_2/mmm$	30.3	59600		30	600
2231	$ZnTa_2O_6$	1400	Orthorhombic Pbcn	30.3	87580		9	1013
2232	$Eu(Zr_{1/3}Ti_{2/3})O_6$	1600	Aeschyenite Orthorhombic Pnma	30.4	11000	4.5	−4	1014
2233	$Nd(Zn_{1/2}Ti_{1/2})O_3$+1.5 wt% CuO	1240	Complex perovskite Monoclinic	30.4	14000	8	−44	1015
2234	$(AgBi)_{1/2}MoO_4$	690	Tetragonal $I4_1/a$	30.4	12600	8.7	57	677
2235	$Mg_{0.99}Co_{0.01}Ta_2O_6$	1500/2h	Tetragonal $P4_2/mmm$	30.4	72500		44	967
2236	$Eu(Zr_{1/3}Ti_{2/3})O_6$	1600/4h	Aeschyenite Orthorhombic Pnma	30.4	11000		−4	1014

2237	$Ba_{1-x}La_{2x/3}ZrO_3$ (x=0.1)	1430/15h	Cubic Pm3m	30.4	9000	4.7	165	1016
2238	$Ca[(Li_{1/3}Nb_{2/3})_{0.8}Ti_{0.2}]O_{3-d}$+5 wt% LBS glass	950/4h	Complex perovskite Orthorhombic	30.5	14700	4.6	−18	792
2239	$Ba(Y_{1/2}Ta_{1/2})O_3$		Complex perovskite	30.5	38500	9.4	135	1017
2239	$Ba(Y_{1/2}Ta_{1/2})O_3$		Complex perovskite	30.5	38500	9.4	135	1017
2240	$Sr(Al_{1/2}Nb_{1/2})O_3$	1600/4h	Complex perovskite	30.5	10800		−27	823
2241	$0.09[0.5ZnNb_2O_6$-$0.5Zn_3Nb_2O_8]$-*0.91*$ZnTa_2O_6$+3 wt% BBS	950	Composite	30.5	32600		−11	955
2242	$Ba_8ZnTa_6O_{24}$	1400	Hexagonal perovskite	30.5	62000	8.9	36	818
2243	$Sr(Sm_{0.5}Ta_{0.5})O_3$+0.5 wt% Nb_2O_5	1600/4h	Complex perovskite Tetragonal	30.5	45200		−61	859
2244	$Ca(Li_{1/3}Nb_{2/3})O_{3-d}$+4 wt% B_2O_3	1000	Perovskite orthorhombic	30.6	31000		−18	1018
2245	$MgTa_2O_6$	1550	Tetragonal $P4_2/mmm$	30.6	58200		29	926
2246	$Mg_{0.97}Co_{0.03}Ta_2O_6$	1500/2h	Tetragonal $P4_2/mmm$	30.6	89000		43	967
2247	$Sr(Ho_{1/2}Nb_{1/2})O_3$+0.2 wt% B_2O_3	1350/4h	Perovskite Tetragonal	30.6	16650		−66	823
2248	$Sr(Y_{1/2}Nb_{1/2})O_3$+0.2 wt% B_2O_3	1350/4h	Complex perovskite Orthorhombic	30.7	42500		−67	823
2249	$Mg_{0.95}Co_{0.05}Ta_2O_6$	1500/2h	Tetragonal $P4_2/mmm$	30.7	106200		43	967
2250	$Sr(Yb_{1/2}Nb_{1/2})O_3$+0.5 wt% CeO_2	1600/4h	Complex perovskite Orthorhombic Pnma	30.7	26600		−73	823
2251	$Nd(Zn_{1/2}Ti_{1/2})O_3$+1 wt% CuO	1270	Complex perovskite Monoclinic	30.7	158000	8	−45	1015
2252	$Ca(Fe_{1/2}Ta_{1/2})O_3$		Complex perovskite	30.7	3000	5.38		1019
2253	$Mg_{0.5}Zn_{0.5}TiNb_2O_8$	1120/6h	Not available	30.7	66900		−4	1020
2254	$Ca[(Li_{1/3}Nb_{2/3})_{0.8}Ti_{0.2}]O_{3-d}$+5 wt% LMZBS	975	Complex perovskite Orthorhombic	30.7	22600		−18	792
2255	$Sr_6Ta_4ZrO_{18}$+3 wt% Bi_2O_3-B_2O_3	1625/2h	$A_6B_5O_{18}$ type perovskite	30.8	5600		−19	895
2256	$Nd(Zn_{1/2}Ti_{1/2})O_3$+0.75 wt% CuO	1300	Complex perovskite Monoclinic	30.8	147500	8	−45	1015
2257	$Zn(Ti_{1-x}Sn_x)Nb_2O_8$		Orthorhombic Pbcn	30.9	43500		−54	1021
2258	$0.8Li_2ZnTi_3O_8$-$0.2TiO_2$	1100	Ternary spinel cubic $P4_332$	30.9	56100		29	872

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
2259	$0.1BaTiO_3$-$0.9La(Mg_{1/2}Ti_{1/2})O_3$		Perovskite Pbnm	30.9	16330	8.29	−72	933
2260	$Li_{0.774}Zr_{0.057}NbO_3$	1150	Orthorhombic Pnma	30.9	3550		−16	1022
2261	$Ba_3ZnNb_{2-x}Sb_xO_9$ (x=0.75)		Perovskite Cubic Pm3m	30.9	23700	5	0	381
2262	$Ba_3ZnNb_{2-x}Sb_xO_9$ (x=0.5)		Perovskite Cubic Pm3m	30.9	35620	5.3	−11	381
2263	$0.85BaTi_4O_9$-$0.15BaZn_2Ti_4O_{11}$+11 wt% $BaCu(B_2O_5)$	900	Composite	30.9	20200		12	1023
2264	$Ba_{1-x}Ca_x(Nd_{1/2}Nb_{1/2})O_3$		Perovskite Cubic Fm3m	30-42	25000-5000			1017
2265	$Ba_{1-x}Ca_x(Y_{1/2}Ta_{1/2})O_3$		Perovskite	30-22				1017
2266	(1-x)$LaMg_{1/2}Ti_{1/2}$-x$La_{2/3}TiO_3$ (x=0.2)		Perovskite	31.0	43000	6.3	−54	950
2267	2CaO-3NiO-Nb_2O_5-TiO_2	1275	Composite	31.0	7500	4.3	−49	230
2268	(1-x)$Sr(Li_{1/4}Nb_{3/4})O_3$-x$Sr(Li_{2/3}W_{3/5})O_3$ (x=0.333)	1450	Perovskite monoclinic $P2_1/c$	31.0	27400	8.7	−23	951
2269	$(Sr_{0.15}Ba_{0.85})(Yb_{0.5}Ta_{0.5})O_3$	1600/4h	Complex perovskite	31.0	32100		0	859
2270	(1-x)$Ca(Li_{1/4}Nb_{3/4})O_3$-x$Ca(Li_{2/3}W_{3/5})O_3$ (x=0.238)	1150	Provskite monoclinic $P2_1/c$	31.0	22700	10.3	−33	951
2271	(1-x)Ba $(Li_{1/4}Nb_{3/4})O_3$-x$Ba(Li_{2/3}W_{3/5})O_3$ (x=0.333)	1470	Perovskite Cubic P-3m1	31.0	19000	7.8	18	1024
2272	$Sm(Zn_{1/2}Ti_{1/2})O_3$	1310/2h	Perovskite Orthorhombic Pnm	31.0	37000	8	−19	1025
2273	$Ba_3Zn_7Ti_{12}O_{34}$	1150/4h		31.0	4300		−25	1026
2274	BaO-TiO_2-WO_3 (N-35):5 wt% Al_2O_3-SiO_2-B_2O_3	1100	Composite	31.0	5400	5.7	–	786,862
2275	$Ba(Mg_{1/3}Nb_{2/3})O_3$+2 mol% B_2O_3+10 mol% CuO	875	Perovskite composite	31.0	21500		21	1027
2276	$0.5Ba(Mg_{1/2}W_{1/2})O_3$-$0.5BaTiO_3$		Perovskite composite	31.0	8200	–	125	373
2277	$Ba_8Zn(Nb_{6-x}Sb_x)O_{24}$ (x=0.9)	1425		31.0	11550		21	503
2278	Bi_2MoO_6	750	Monoclinic $P2_1/n$	31.0	16700	6.4	−114	494
2279	$(Zr_{0.8}Sn_{0.2})TiO_4$+MnO_2	1350/4h	Orthorhombic Pbcn	31.0	93000	9.3		1028
2280	3Bi_2O_3-2MoO_3	820		31.0	1000		−41	494
2281	$Mg_4La_2Ti_5O_{17}$	1350/4h		31.0	15000		4	1029

2282	$BaO\text{-}4.3TiO_2\text{-}0.5ZnO$+7 wt% BCB	900	Composite	31.0	18200		4	1030
2283	$(Zn_{0.5}Co_{0.5})TiO_3$	1150	Perovskite	31.0	60000		75	704
2284	$0.75(Al_{1/2}Ta_{1/2})O_2\text{-}0.25(Ti_{1-x}\ Sn_x)O_2$	1450/3h	Composite	31-26	54600-70700		13 to −9	949
2285	$0.95Ba(Zn_{1/2}Ta_{2/3})O_3\text{-}0.05[Sr_{0.25}Ba_{0.75}](Ga_{1/2}Ta_{1/2})O_3$	1500	Perovskite	31.0	210000			971
2286	$Ba_3Zn_7Ti_{12}O_{34}$	1150/4h	Orthorhombic	31.0	4300	10	−25	1026
2287	$Ba_{0.85}Sr_{0.15}(Y_{1/2}Ta_{1/2})O_3$	1600	Complex perovskite	31.0	32000		0	861
2288	$Sr(La_{1/2}Ta_{1/2})O_3$	1600/4h	Complex perovskite	31.0	4500		−42	861
2289	$Sr(Sm_{1/2}Ta_{1/2})O_3$	1600/4h	Complex perovskite	31.0	45200		−61	861
2290	$Sr(Al_{1/2}Nb_{1/2})O_3$	1600/24h	Complex perovskite	31.0	10800		−27	823,1031
2291	$Ca(Y_{1/2}Nb_{1/2})O_3$	1550/4h	Perovskite Orhorhombic	31.0	35000		−13	763
2292	$Sr(Yb_{1/2}Nb_{1/2})O_3$	1600/4h	Complex perovskite	31.0	26600		−73	823
2293	$Ca(Li_{1/3}Nb_{2/3})O_{3\text{-}\delta}$+4 wt% B_2O_3	1000	Complex perovskite	31.0	31000		−18	1018
2294	$0.4CaTiO_3\text{-}0.6Sm(Mg_{0.5}Ti_{0.5})O_3$	1550	Perovskite	31.0	12000	5.3	−28	865
2295	$2CaO\text{-}3MgO\text{-}Nb_2O_5\text{-}TiO_2$	1325	Composite	31.0	33000	4.6	−10	230
2296	$Ca_4MgTa_2TiO_{12}$	1625	Perovskite	31.0	43000	4.7	−62	230
2297	$Ba(Li_{1/4}Nb_{3/4})O_3\text{-}Ba(Li_{2/3}W_{3/5})O_3$	1470	Perovskite Cubic	31.0	19000	7.8	18	1024
2298	$Ca_4NiTa_2TiO_{12}$	1625	Perovskite Orthorhombic Pnma	31.0	40000	4.7	−26	230
2299	$Ba(Ni_{1/3}Nb_{2/3})O_3$	1400	Complex perovskite Cubic Pm3m	31.0	48000		−18	1032
2300	$Ba(Mg_{1/3}Nb_{2/3})O_3$	1350	Complex perovskite P-3m1 Hexagonal	31.0	46000		18	1033
2301	$Ba_4SrTa_4O_{15}$ $(A_nB_{n-1}O_{3n})$	1575	Trigonal P3m1 perovskite	31.1	9500	5.2	8	851
2302	$Pr_{0.16}Gd_{0.8}TiNbO_6$	1400	Orthorhombic	31.1	3180		−8	564
2303	$SrEr_{1/2}Nb_{1/2})O_3$+0.2 wt% B_2O_3	1350/4h	Complex perovskite Orthorhombic	31.1	38400		−71	823
2304	$SmTaTi_{0.7}Zr_{0.3}O_6$			31.1	37481		−2	671
2305	$Ca[(Li_{1/3}Nb_{2/3})_{1-x}Zr_x]O_3$ (x=0.3)	1150	Perovskite orthorombic	31.1	27100		−15	733
2306	TeO_2+12.5 wt% $CaTiO_3$		Composite	31.2	14800		18	444
2307	$ZnTa_2O_6$+0.25 wt% CaF_2	1225/4h	Orthorhombic Pbcn	31.3	73600	6.8	−7	1034
2308	$0.5Ba(Mg_{1/2}W_{1/2})O_3\text{-}0.5BaTiO_3$	1500/6h	Perovskite Hexagonal	31.2	8200		125	373

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
2309	$Sr(La_{0.5}Ta_{0.5})O_3$+0.5 wt% Nb_2O_5	1600/4h	Rhombohedral R3m complex Perovskite	31.2	4500		−42	859
2310	$Sr(Dy_{1/2}Nb_{1/2})O_3$+0.2 wt% B_2O_3	1350/4h	Complex perovskite Tetragonal	31.2	30300		−63	823
2311	$0.75(Al_{1/2}Ta_{1/2})O_2$-$0.25TiO_2$	1450	Composite	31.2	54600		13	949
2312	$Nd(Zr_{1/3}Ti_{2/3})O_6$	1600	Aeschyenite Orthorhombic Pnma	31.4	15800	4.3	6	1014
2313	$(Zr_{0.8}Sn_{0.2})TiO_4$+10 wt% BaO-B_2O_3-SiO_2-Li_2O-CuO	1050/4h	Orthorhombic Pbcn	31.4	32200		−1	515
2314	$Nd(Zr_{1/3}Ti_{1/3})O_6$	1600/4h	Aeschyenite Orthorhombic Pnma	31.4	15800		6	1014
2315	$Ca(Ho_{1/2}Nb_{1/2})O_3$	1550/4h	Complex perovskite Orthorhombic	31.4	32000		3	763
2316	$Bi[Sb_{1-x}(Nb_{0.992}V_{0.008})_x]O_4$ (x=0.2)		Monoclinic I2/c	31.4	8000		8	715
2317	$Ba[Ti_{1-x}(Zn_{1/2}W_{1/2})_x]O_3$ (x=1)	1420	Cubic perovskite $Fm3^-m$	31.4	20900		−1	695
2318	$0.9Ba(Zn_{1/3}Ta_{2/3})O_3$-$0.1BaTi_4O_9$	1320	Perovskite Hexagonal Composite	31.5	68500	6	4	1035
2319	$Ba[(Mg_{1-x}Co_x)_{1/3}Nb_{2/3}]O_3$ (x=0.05)		Perovskite Trigonal P-3m1	31.5	45000		17	1036
2320	$(Zr_{1-x}Sn_x)(Li_{1/3}Nb_{3/4})_{0.4}Ti_{0.6}O_4$ (x=0.3)	1140	–	31.5	58300		−33	1037
2321	$Sr(Nd_{0.5}Ta_{0.5})O_3$+0.5 wt% Nb_2O_5	1600/4h	Complex perovskite Tetragonal	31.5	38500		−55	859
2322	$(Li_{0.5}Bi_{0.5})(W_{0.6}Mo_{0.4})O_4$	620		31.5	8500	8.2	20	1038
2323	$Nd(Zn_{1/2}Ti_{1/2})O_3$	1330/4h	Pervskite Monoclinic	31.6	170000	8.5	−42	1039
2324	$Sr(Sm_{0.5}Ta_{0.5})O_3$+0.5 wt% Nb_2O_5 0.2 wt% TiO_2	1600/4h	Complex perovskite Tetragonal	31.6	46400		−55	859
2325	$SmTaTi_{0.8}Zr_{0.2}O_6$		Cubic Fd3m	31.7	30654		6	671
2326	$(Zr_{0.8}Sn_{0.2})TiO_4$+10 wt% BaO-B_2O_3-SiO_2-Li_2O-CuO	1050/12h	Composite	31.7	29700		−2	1040
2327	$Ba_5NbTa_3O_{15}$ ($A_nB_{n-1}O_{3n}$)	1500	Trigonal P3m1 perovskite	31.7	21500		16	851
2328	$BaSr_4Ta_4O_{15}$($A_nB_{n-1}O_{3n}$)	1600	Trigonal P3m1 perovskite	31.7	2800	5.34	−60	851
2329	90 wt% $BaTi_4O_9$+10 wt% Li_2O-B_2O_3-SiO_2	875	Composite	31.7	9000		10	592
2330	$Ba[(Mg_{1-x}Co_x)]_{1/3}Nb_{2/3}]O_3$ (x=0.8)		Perovskite	31.7	76900		3	1041
2331	$BaLi_2Ti_6O_{14}$	1025	Orthorhombic Cmca	31.7	23300	7.3	−15	1012
2332	$Sr(Sm_{1/2}Nb_{1/2})O_3$	1500	Complex perovskite Monoclinic $P2_1/n$	31.8	41000	8.1	−45	590

2333	$Nd[(Co_{0.02}Zn_{0.8})_{1/2}Ti_{1/2}]O_3$		Perovskite monoclinic	31.8	176000	9.0	−43	1042
2334	$BaNb_2P_2O_{11}$	1150	Trigonal R3-c	31.8	24100		45	268
2335	$(Zr_{1-x}Sn_x)(Li_{1/4}Nb_{3/4})_{0.4}Ti_{0.6}O_4$ (x=0.3)		–	31.8	58300		−33	1043
2336	$ZnTiNb_2O_8$+2 wt% Li_2O-ZnO-B_2O_3	875	Ixiolite	31.8	25000		−62	1044
2337	$Ba[(Ni_{1/3}Nb_{2/3})_{1-x}Zr_x]O_3$ (x=0.1)	1650	Perovskite	31.8	36100		8	1045
2338	MBRT-90+10 wt% Li_2O-B_2O_3-SiO_2-CaO-Al_2O_3 (28:27:30:5:10)	875	Composite	31.9	2200		20	510
2339	$Ba(Mg_{1/3}Nb_{2/3})O_3$		Complex perovskite Trigonal P-3m1	32.0	55500	10	33	787
2340	$Sr(Pr_{0.5}Ta_{0.5})O_3$+0.5 wt% Nb_2O_5	1600/4h	Complex perovskite Tetragonal	32.0	8400		−50	859
2341	$Ba(Yb_{1/2}Ta_{1/2})O_3$+0.5 wt% Nb_2O_5	1575	Complex perovskite	32.0	35850		112	845
2342	$Ca[(Li_{1/3}Nb_{2/3})_{0.95}Zr_{0.15}]O_{3+d}$+15 wt% ZnO-$B_2O_3$-$SiO_2$ glass rit	940/4h	Perovskite orthorhombic	32.0	66400		−27	1046
2343	$La_6Mg_{0.913}Ti_{4.04}O_{18}$		Perovskite slab series	32.0	31000	6.1	−46	950
2344	$Ca_5Nb_2Ti_{0.4}Hf_{0.6}O_{12}$	1675	Perovskite Orthorhombic Pnma	32.0	22000	4.5	±0.5	490
2345	$Ba(Mg_{1/3-x}Nb_{2/3})O_{3-\delta}$ (x=0.02)	1450	Complex perovskite Trigonal P-3m1	32.0	96000		30	1047
2346	$Ba(Co_{1/3}Nb_{2/3})O_3$	1400	Complex perovskite Trigonal P-3m1	32.0	78000		−12	1048,1049
2347	$Ba(Yb_{1/2}Ta_{1/2})O_3$	1625/4h	Complex perovskite	32.0	35900		112	943
2348	$Ca(Fe_{1/2}Ta_{1/2})O_3$	–	Complex perovskite Orthorhombic Pbnm	32.0	20000		−61	609
2349	$Ca(Er_{1/2}Nb_{1/2})O_3$	1550/4h	Complex perovskite	32.0	31800		−18	763
2350	$Ca(Dy_{1/2}Nb_{1/2})O_3$	1550/4h	Complex perovskite Orthorhombic	32.0	32500		5	763
2351	$Sr(Sm_{1/2}Ta_{1/2})O_3$+0.2 wt% TiO_2	1600	Complex perovskite	32.0	46400		−46	861
2352	$Sr(Pr_{1/2}Ta_{1/2})O_3$	1600/4h	Complex perovskite	32.0	8400		−50	861
2353	$Sr(Nd_{1/2}Ta_{1/2})O_3$	1600/4h	Complex perovskite	32.0	38500		−55	861
2354	$Sr(Ho_{1/2}Nb_{1/2})O_3$	1600/4h	Complex Perovskite	32.0	20400		−65	823
2355	$Sr(Y_{1/2}Nb_{1/2})O_3$	1600/4h	Complex Perovskite	32.0	38800		−66	823
2356	$Sr(Er_{1/2}Nb_{1/2})O_3$	1575/4h	Complex perovskite	32.0	36100		−67	823

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
2357	$BaO\text{-}2CeO_2\text{-}5TiO_2$	1250	Composite	32.0	19100		41	909
2358	$EuTiNbO_6$	1370	Orthorhombic Pbnm	32.0	17250	5.3	5	563
2359	$5CaO\text{-}2Nb_2O_5$	1500	Mixed phases	32.0	6500	6.48	−37	325
2360	$BaTi_4O_9$+10 wt% glass frit	875	Composite	32.0	9000		10	1050
2361	$0.1(Na_{0.5}La_{0.5})TiO_3\text{-}0.9CeO_2$	1400	Mixed phases	32.0	8200		0	1051
2362	$SrLi_2Ti_6O_{14}$+0.5 wt% BCB	900	Orthorhombic Cmca	32.0	12900		−5	1012
2363	$3CaO\text{-}2CoO\text{-}Nb_2O_5\text{-}TiO_2$	1400	Composite	32.0	15000	4.3	−18	230
2364	$0.25Ca_2AlNbO_6\text{-}0.75Ca_3Nb_2O_8$		Mixture phases	32.0	7500	6.34	64	864
2365	$ZnTa_2O_6/MgNb_2O_6/ZnTa_2O_6$ (6:1:6) Vf layered	–	Composite	32.0	82800		0	1052
2366	$La_5Ti_4CrO_{17}$	1600/2h	Orthorhombic Pnnm	32.0	5700		−24	911
2367	$Ba(Cd_{1/3}Ta_{2/3})O_3+B_2O_3$	1350	Complex perovskite Cubic Pm3m	32.0	50000	2	80	1053
2368	$Ca_5Nb_2Ti_{0.4}Hf_{0.6}O_{12}$	1675	Perovskite Orthorhombic Pnma	32.0	22000	4.458	≈0	490
2369	$BaO\text{-}TiO_2\text{-}WO_3$ (N-35):5 wt% $Al_2O_3\text{-}SiO_2$	1100	Composite	32.0	11000	5.6	–	862
2370	$Ca[(Li_{1/3}Nb_{2/3})_{0.8}Ti_{0.2}]O_{3\text{-}d}$+3 wt% LBS	1025	Complex perovskite orthorhombic	32.0	20000		−18	792
2371	$SnTe_3O_8$	700/15h	Cubic Ia3	32.0	13200	4		53
2372	$La_6Mg_{0.913}Ti_{4.04}O_{18}$			32.0	31000	6.1	−46	950
2373	$Ba(Sn_{0.226}Zn_{0.258}Nb_{0.516})O_3$	1500	Perovskite Cubic Pm3m	32.0	97000		12	1054
2374	$Ba(Zn_{1/3}Nb_{2/3})O_3$+5 mol% B_2O	900	Perovskite Cubic Pm3m	32.0	3500		20	1055
2375	$Sr(Sm_{0.5}Ta_{0.5})O_3$+0.5 wt% Nb_2O_5 0.25 wt% TiO_2	1600/4h	Complex perovskite Tetragonal	32.1	38600		−46	859
2376	$(Ca_2Mg_{2.75}Pb_{0.25})Nb_2(Ti_{0.75}Zr_{0.25})O_{12}$	1275		32.2	12250		−35	799
2377	$Sr(Er_{1/2}Nb_{1/2})O_3$+0.5 wt% CeO_2	1600/4h	Perovskite Orthorhombic	32.2	36100		−67	823
2378	$Sr(Y_{1/2}Nb_{1/2})O_3$+0.5 wt% CeO_2	1600/4h	Complex perovskite Orthorhombic	32.2	38850		−66	823
2379	$Ba_5Nb_3TaO_{15}$	1435	Trigonal P-3m1 perovskite	32.2	4700	4.4	35	851
2380	$Sr(Ho_{1/2}Nb_{1/2})O_3$+0.5 wt% CeO_2	1600/4h	Complex perovskite Tetragonal	32.3	20400		−65	823

2381	$Sr(Tb_{1/2}Nb_{1/2})O_3$+0.2 wt% B_2O_3	1350/4h	Complex perovskite Tetragonal	32.3	33500		−64	823
2382	$Ba_6Nb_4ZrO_{18}$	1625/2h	$A_6B_5O_{18}$ type perovskite Trigonal R-3m	32.4	52000		25	895
2383	$(Zr_{1-x}Sn_x)(Li_{1/4}Nb_{3/4})_{0.4}Ti_{0.06}O_4$ (x=0.2)		Not available	32.4	50300		−24	1037
2384	$Bi_2W_2O_9$	875	Orthorhombic Pbn21	32.5	7700	5.5	−63	1056
2385	$(Sr_{0.05}Ba_{0.95})(Y_{0.5}Ta_{0.5})O_3$	1600/4h	Complex perovskite	32.5	47300		0	859
2386	$Ca[(Li_{1/3}Nb_{2/3})_{0.8}Ti_{0.2}]O_{3-d}$+5 wt% ZnB_2O_4 glass	940	Perovskite Orthorhombic	32.5	20600		−26	1057
2387	$0.6Ba(Co_{1/3}Nb_{2/3})O_3$-$0.4Ba(Ni_{1/3}Nb_{2/3})O_3$+0.5 wt% CuO	1270	Composite	32.5	82000	9	−21	1058
2388	$0.09[0.5ZnNb_2O_6$-$0.5Zn_3Nb_2O_8]$-*0.91*$ZnTa_2O_6$+3 wt% ZBS	950	Composite	32.5	32400		−7	955
2389	$Ba_6Ti_{1-x}Sn_xNb_4O_{18}$ (x=0.75)	1510	Trigonal R-3m	32.6	25800	6.2	18	982
2390	$0.9MgTiO_3$-$0.1BaTiO_3$	1325	Composite	32.7	31700		−85	1059
2391	$ZnTiNb_2O_8$+$BaCu(B_2O_5)$	950	Orthorhombic Pbcn	32.6	20100	5.1	−64	1060
2392	$Nd[(Zn_{0.925}Co_{0.075})_{0.5}Ti_{0.5}]O_3$	1390/4h	Not available	32.6	185300		31	1061
2393	$ZnNb_2O_6$+1.5 wt% (CuO-V_2O_5-Bi_2O_3)	870/2h	Orthorhombic columbite Pbcn	32.7	67100		−47	1062
2394	$0.7TeO_2$-$SnTe_3O_8$	650	Mixture phases	32.7	8800		−33	62
2395	$(Bi_{0.8}La_{0.2})_2Mo_2O_9$		MonoclinicP21/n	32.7	13500		−5	1063
2396	$(Zr_{1-x}Sn_x)(Li_{1/4}Nb_{3/4})_{0.4}Ti_{0.6}O_4$ (x=0.2)		–	32.7	47900		−4	1043
2397	$0.09[0.5ZnNb_2O_6$-$0.5Zn_3Nb_2O_8]$-*0.91*$ZnTa_2O_6$+1 wt% ZBS	1050	Composite	32.7	41000		−22	955
2398	$Ca[(Li_{1/3}Nb_{2/3})_{0.75}Ti_{0.25}]O_{3-d}$+5 wt% LBS glass	950/4h	Perovskite Orthorhombic	32.8	11500	4.5	−3	792
2399	$0.Ba(Zn_{1/3}Nb_{2/3})O_3$-$0.7ZnNb_2O_6$	1200/8h	Composite	32.8	34100		−10	1064
2400	$Ba_{1-z}Sr_z[Zn_{1/3}(Ta_pNb_{1-p}]_-Sr_{1-x}Ca_x(Ga_{1/2}Ta_{1/2})]O_3$		Perovskite	32-34	180000-80000	7	0-10	1065
2401	$Sr(Mg_{1/3}Nb_{2/3})O_3$:Mn		Perovskite Trigonal P-3m1	33.0	23700	10.3	−14	787
2402	$BaTi_4O_9$+5 wt% ZnO-B_2O_3 glass	900/2h	Orthorhombic+$Zn(BO_2)_2$ second phase Pmmn	33.0	27000		7	1066
2403	$3CaO$-$2CoO$-Nb_2O_5-TiO_2	1400	Composite	33.0	15000	4.3	−18	230

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
2404	$Sr(Dy_{1/2}Nb_{1/2})O_3$	1575/4h	Complex perovskite	33.0	32700		−63	823
2405	$Ba[(Ni_{0.6}Zn_{0.4)1/3}Nb_{2/3}]O_3$+1 mol% B_2O_3	1300	Perovskite Cubic Pm3m	33.0	39700		−4	1067
2406	$Ba[Ti_{1-x}(Zn_{1/2}W_{1/2})_x]O_3$ (x=0.9)	1380	Cubic perovskite Fm3⁻m	33.0	19900		0	695
2407	$Ba_{0.95}Sr_{0.05}(Y_{1/2}Ta_{1/2})O_3$	1600	Complex perovskite	33.0	47300		0	861
2408	$Ba(Y_{1/2}Ta_{1/2})O_3$	1625/4h	Complex perovskite cubic	33.0	50200		120	943
2409	(1-x)$LaMg_{1/2}Ti_{1/2}O_3$-x$La_{2/3}TiO_3$ (x=0.3)		Perovskite	33.0	43000	6.3	−54	950
2410	$Bi_6Te_2O_{15}$(oxygen atm)	800/15h	Orthorhombic	33.0	41000		−85	1068
2411	$Ca[Li_{1/3}Nb_{2/3}]_{0.75}Ti_{0.25}]O_{3-\delta}$+5 wt% Li_2O-B_2O_3-SiO_2	950/4h	Perovskite Orthorhombic	33.0	11500		−5	792
2412	$Ba(Cd_{1/3}Ta_{2/3})O_3$+2 wt% ZnO	1550	Complex perovskite Cubic Pm3m	33.0	37500		80	1069
2413	$La_5AlTi_3O_{15}$	1600/3h	Not available	33.0	28600		−39	954
2414	$Li_{0.774}Zr_{0.057}NbO_3$	1150	Perovskite Orthorhombic	33.0	4460		−28	1070
2415	$Ba_{1/3}La_{2/3}Zn_{1/3}Ti_{2/3}O_3$		Perovskite	33.0	19000	6.7	−11	919
2416	0.5$SrTiO_3$-0.5$LaAlO_3$	1550/20h	Psuedo Cubic perovskite	33.0	54000			1071
2417	$Sr(Dy_{1/2}Nb_{1/2})O_3$+0.5 wt% CeO_2	1575/4h	Complex Perovskite	33.0	32700		−63	823
2418	$Ba(Y_{1/2}Ta_{1/2})O_3$+0.5 wt% Nb_2O_5	1575	Complex perovskite	33.0	50150		120	845
2419	$Ba_3Sr_2Ta_4O_{15}(A_nB_{n-1}O_{3n})$	1575	Hexagonal perovskite	33.2	4300	5.2	−15	851
2420	$Sr_5Nb_2Ta_2O_{15}(A_nB_{n-1}O_{3n})$	1575	Hexagonal perovskite	33.2	2500	5.65	−2	851
2421	$Ba_3ZnNb_{2-x}Sb_xO_9$ (x=0.375)		Perovskite	33.2	44940		−3	381
2422	(1-x)$La(Mg_{1/2}Ti_{1/2})O_3$-x$La_{2/3}TiO_3$ (x=0.37)		Orthorhombic Imma	33.2	8560	8.3		889
2423	$La_5CrTi_3O_{15}$	1625/2	$A_5B_4O_{15}$ type cation deficient perovskite Trigonal P3m	33.2	27500	4.88	−34	1072
2424	$La_4PrCrTi_3O_{15}$	1575/2	$A_5B_4O_{15}$ type cation deficient Perovskite Trigonal P3m	33.2	23700	4.7	−22	1072
2425	$Ba_5SrTa_4TiO_{18}$	1550/2h	$A_6B_5O_{18}$ type perovskite	33.2	33000		65	895
2426	$Ba_2Ti_3Nb_4O_{15}$+3 wt% ZBS	925	Tetragonal	33.2	13600		6	1073

2427	$Ba[(Y_{0.85}Pr_{0.15})_{1/2}Ta_{1/2}]O_3$+0.5 wt% Nb_2O_5	1575	Complex perovskite	33.2	51500		0	845
2428	$Ba((Co_{0.6-x/2}Zn_{0.4-x/2}Mg_x)_{1/3}Nb_{2/3})O_3$ (x=0.3)	annealed 1400/12h	Complex perovskite	33.2	117200		14	1074
2429	$Pr(Zr_{1/3}Ti_{2/3})O_6$	1600/4h	Aeschyenite Orthorhombic Pnma	33.3	16200	4.3	14	1014
2430	(Ba0.95Sr0.05)(Co1/3Nb2/3)O3		Perovskite	33.3	87100		4	1075
2431	$Ce(Zr_{1/3}Ti_{1/3})O_6$	1600/4h	Aeschyenite Orthorhombic Pnma	33.4	15800		14	1014
2432	$Zr_{0.8}Sn_{0.2}TiO_4$+4 wt% WO_3	1400	Orthorhombic Pbcn	33.4	56000		0	1076
2433	Bi_2O_3	680	Tetragonal P-42_1c	33.5	18700	8.7	−235	30
2434	$Ba(Ho_{1/2}Ta_{1/2})O_3$+0.5 wt% Nb_2O_5	1575	Perovskite	33.5	24050		130	845
2435	$La_4NdCrTi_3O_{15}$	1600/2		33.5	18000	4.7	−36	1072
2436	$Ba(Ho_{/2}Ta_{1/2})O_3$	1625	Complex perovskite Tetragonal	33.5	24000		130	943
2437	$Sr(Gd_{1/2}Nb_{1/2})O_3$+0.2 wt% B_2O_3	1350/4h	Complex perovskite Tetragonal	33.5	8350		−60	823
2438	$Ba_8Zn(Nb_{6-x}Sb_x)O_{24}$ (x=0.6)	1425	Perovskite	33.6	11500		30	503
2439	$SrLi_2Ti_6O_{14}$	1000	Orthorhombic Cmca	33.6	8700	6.8	−3	1012
2440	$Zn_{0.85}Co_{0.15}Ta_2O_6$	1325/2h	Orthorhombic Pbcn	33.7	53300		42	1077
2441	$BaTi_4O_9$+10 wt% BaO-Li_2O-B_2O_3-SiO_2-ZnO glass	925	Composite	33.7	14500			1078
2442	$Ba_{1+x}[(Co_{0.7}Zn_{0.3})_{1/3}Nb_{2/3}]O_3$ (x=-0.01)	1450/10h	Perovskite Trigonal P-3m1	33.7	70900		−4	1079
2443	$Ba[(Co_{0.6-x/2}Zn_{0.4-x/2}Mg_x)_{1/3}Nb_{2/3}]O_3$ (x=0.3)		Perovskite Trigonal P-3m1	33.7	93800		10	1080
2444	$Ba_2Sr_3Ta_4O_{15}(A_nB_{n-1}O_{3n})$	1600	Trigonal P-3m1 perovskite	33.7	2400	5	−25	851
2445	$(Sr_{0.1}Ba_{0.9})(Ti_{0.1}Zn_{0.3}Ta_{0.6})O_3$		–	33.7	36000	7	23	1003
2446	$ZnTa_2O_6$	1400/10h	Orthorhombic Pbcn	33.7	79310	8.5	9	1081
2447	$Sr(Tb_{1/2}Nb_{1/2})O_3$+0.5 wt% CeO_2	1575/4h	Complex perovskite Tetragonal	33.7	36300		−61	823
2448	$Zn_{0.87}Co_{0.13}Ta_2O_6$	1325/2h	Orthorhombic Pbcn	33.8	66300		43	1077
2449	93 wt% $BaTi_4O_9$+10 wt% Li_2O-B_2O_3-SiO_2	950	Composite	33.8	12700		25	592
2450	$(Sr_{1-x}Ba_x)(Y_{1/2}Nb_{1/2})O_3$ (x=0.65)	1600/4h	Complex perovskite	33.8	45600		0	823
2451	$Ba_4ZnTi_{11}O_{27}$+4 wt% $BaCu)B_2O_5$)	1200/2h	Monoclinic C2/m	33.8	12200	6.18	7	1082

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
2452	$Sr_6Nb_4ZrO_{18}$+2 wt% Bi_2O_3-B_2O_3	1625/2h	$A_6B_5O_{18}$ type perovskite	33.9	21000		−8	895
2453	$(Bi_{0.9}Nd_{0.1})_2Mo_2O_9$		Monoclinic $P2_1/n$	33.9	15200		8	1063
2454	$Ba_{1-x}La_{2x/3}(Co_{0.7}Zn_{0.3})_{1/3}$ $Nb_{2/3}O_3$ (x=0.01)	1425/10h	Complex perovskite	34.0	63000		5	1083
2455	$Ba_4LiNb_{3-x}Ta_xO_{12}$ (x=1)	1350	Hexagonal perovskite $P6_3mc$	34.0	56000		43	941
2456	$Ba(Dy_{1/2}Ta_{1/2})O_3$+0.5 wt% Nb_2O_5	1575	Complex perovskite	34.0	20650		−48	845
2457	$Sr_{4-m}La_mTi_{m-1}Ta_{4-m}O_{12}$ (m=2)	1580	Not available	34.0	35000		−15	975
2458	$Ba_8Li_2Nb_2Ta_4O_{24}$		Hexagonal $P6_3mmc$	34.0	56000			952
2459	$Bi(Sb_{1-x}Ta_x)O_4$ (x=0.6)	960	Orthorhombic $Pc2_1n$	34.0	30,000		−16	581
2460	$ZnTiNb_2O_8$	1250/2h	Orthorhombic Pbcn	34.0	42500		−52	632
2461	$0.2TiTe_3O_8$-$0.8TeO_2$	670	Composite	34.0	22000		24	586
2462	BaO-TiO_2-WO_3 (N-35): B_2O_3	1200		34.0	70500	8.5	–	786, 862
2463	$La(Zn_{1/2}Ti_{1/2})O_3$	1550	Perovskite	34.0	59000	10	−52	1084, 1085
2464	$Ba_{10}Ta_{8-0.8x}Ti_xO_{30}$ (x=0.6)	1400/40h	$A_nB_{n-1}O_{3n}$ Hexagonal Perovskite $P6_3/mmc$	34.0	30820		57	920
2465	$Ca_5Ta_2Ti_{0.6}Hf_{0.4}O_{12}$	1675	Complex perovskite Orthorhombic Pnma	34.0	26000	4.4	0	490
2466	$Ca_5Nb_2Ti_{0.2}Zr_{0.8}O_{12}$	1670	Complex perovskite Orthorhombic Pnma	34.0	24000	4.4	0	662
2467	$0.25Ba(Zn_{1/3}Nb_{2/3})O_3$-$0.75Ba(Mg_{1/3}Nb_{2/3})O_3$+$B_2O_3$-LiF	1350	Perovskite Trigonal P-3m1	34.0	76700	7.6	−4	1086
2468	$La_5Mg_{0.5}Ti_{3.5}O_{15}$		Trigonal P-3m1	34.0	31000	6	−16	950, 958
2469	$La_4SmCrTi_3O_{15}$	1575/2		34.0	15900	4.89	−38	1072
2470	$0.5CaTiO_3$-$0.5Sm(Mg_{0.5}Ti_{0.5})O_3$	1550	Perovskite	34.0	10400	4.91	−24	865
2471	$(1-x)(Mg_{0.95}Zn_{0.05})TiO_3$-$xCa_{0.6}La_{0.8/3}TiO_3$ (x=0.3)	1320/4h		34.0	61000		66	465
2472	$Ca[(Li_{1/3}Nb_{2/3})_{0.84}Ti_{0.16}]O_{3-\delta}$+2 wt% LiF+3 wt% B_2O_3	900/2h	Perovskite	34.0	17400		−5	752
2473	$Ba(Dy_{1/2}Ta_{1/2})O_3$	1625	Complex perovskite Tetragonal	34.0	20600		−48	943

2474	$Sr(Gd_{1/2}Nb_{1/2})O_3$	1575/4h	Perovskite	34.0	8800		−56	823
2475	$0.99Ba(Co_{1/3}Nb_{2/3})O_3$-$0.01Ba(Y_{1/2}Nb_{1/2})O_3$	1380	Perovskite	34.0	38690			1087
2476	$0.95Ba(Yb_{1/2}Nb_{1/2})O_3$-$0.05Ca(Y_{1/2}Nb_{1/2})O_3$	1600	Perovskite	34.0	47500		1	763
2477	$Sr(Tb_{1/2}Nb_{1/2})O_3$	1575/4h	Perovskite	34.0	36300		−61	823
2478	$Ca_5Nb_2Ti_{0.2}Zr_{0.8}O_{12}$	1670	Perovskite Pnma Orthorhombic	34.0	24000	4.4	0	662
2479	$Ca_5Ta_2Ti_{0.6}Hf_{0.4}O_{12}$	1675	Perovskite Pnma Orthorhombic	34.0	26000	4.4	0	490
2480	$xBa(Zn_{1/3}Nb_{2/3})O_3$-(1-x)Ba $(Mg_{1/3}Nb_{2/3})O_3$ (x=0.25)	1500	Perovskite Hexagonal P-3m1	34.0	76700		−4	1086
2481	$Ba[(Ni_{0.6}Zn_{0.4)1/3}Nb_{2/3}]O_3$+0.5 mol% B_2O_3	1340	Perovskite Hexagonal P-3m1	34.0	42100		−8	1067
2482	$LiNb_3O_8$	1075/3h	Monoclinic $P2_1/a$	34.0	58000		−96	788
2483	$Zr_{0.034}Hf_{0.966}TiO_4$		Orthorhombic Pbcn	34.1	34000	9.9		1088
2484	$0.09[0.5ZnNb_2O_6$-$0.5Zn_3Nb_2O_8]$-*0.91*$ZnTa_2O_6$+1 wt% ZBS	1000	Composite	34.1	37100		−3	955
2485	$ZnTi(Nb_{1-x}Ta_x)_2O_8$ (x=0.05)	1140/6h	Orthorhombic Pbcn	34.1	40000		−66	1089
2486	$Ca[(Li_{1/3}Nb_{2/3})_{0.8}Ti_{0.2}]O_{3-d}$+15 wt% LMZBS	900	Composite	34.1	11500		−21	792
2487	$Ba_2SrYNb_3O_{12}$	1450	Perovskite Trigonal R-3	34.1	31900		74	990
2488	$Ba_8Ta_4Ti_3O_{24}$			34.2	23050		76	920
2489	$Ba_5Nb_2Ta_2O_{15}$	1475	Perovskite	34.2	10500		22	1090
2490	$0.7BaTi_4O_9$-$0.3BaZn_2Ti_4O_{11}$	1240/3h	Composite	34.2	60600		−2	1091
2491	$Ca[(Li_{1/3}Nb_{2/3})_{0.8}Ti0._2]O_{3-d}$+1 wt% LBS	1100	Perovskite Orthorhombic	34.2	22900		−10	792
2492	$Ca[(Li_{1/3}Nb_{2/3})_{0.8}Ti_{0.2}]O_{3-d}$+3 wt% LMZBS	1025	Complex Perovskite Orthorhombic	34.2	24500		−5	792
2493	$Ba(Sm_{1/2}Ta_{1/2})O_3$	1500	Perovskite	34.3	27000	7.7	5	590
2494	$Ba[Ni_{0.6}Zn_{0.4}]_{0.33}Nb_{0.67}]O_3$+0.5 mol% B_2O_3	1350	Perovskite Hexagonal P-3m1	34.3	42100		−3	1067
2495	$0.5ZnNb_2O_6$-$0.5TiO_2$	1250/2h	Composite	34.3	42500		−52	1092
2496	$ZnTiNb_2O_8$	1250	Orthorhombic Pbcn	34.3	42500		−52	1093

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
2497	$Zn_{0.89}Co_{0.11}Ta_2O_6$	1325/2h	Tri rutile Tetragonal	34.3	72000		44	1077
2498	$Ca[(Li_{1/3}Nb_{2/3})_{0.84}Ti_{0.16}]O_{3-\delta}$+2 wt% LiF+3 wt% ZnO-$B_2O_3$-$SiO_2$	900/2h	Complex Perovskite Orthorhombic	34.3	17400		−5	1094
2499	$Ba_3Sr_2Ta_4O_{15}$	1575		34.3	4000		−15	1090
2500	$Sr(Gd_{1/2}Nb_{1/2})O_3$+0.5 wt% CeO_2	1575/4h	Complex perovskite Tetragonal	34.3	8800		−56	823
2501	$Sr(Eu_{1/2}Nb_{1/2})O_3$+0.2 wt% B_2O_3	1350/4h	Complex perovskite Tetragonal	34.3	37600		−54	823
2502	$Ca(Zn_{0.333}Nb_{0.662}V_{0.005})O_3$	1200/3h		34.3	16400		−17	1095
2503	$0.5La_{2/3}TiO_3$-$0.5LaAlO_3$	1425	Perovskite Orthorhomic	34.4	45000	6.7	−23	1096
2504	$(NaBi)_{1/2}MoO_4$	690	Tetragonal $I4_1/a$	34.4	12300	7.5	43	677
2505	$(Zr_{1-x}Sn_x)(Li_{1/4}Nb_{3/4})_{0.4}Ti_{0.06}O_4$ (x=0.5)			34.4	44500		−14	1043
2506	$Bi_2Te_2W_3O_{16}$		Monoclinic C2/c	34.5	3200		−92	886
2507	$Ba_3Co_{0.7}Zn_{0.3}Nb_2O_9$+0.4 wt% CeO_2	1450/4h	Perovskite Trigonal P-3m1	34.5	84000	4	0	1097
2508	$0.7Ba(Co_{1/3}Nb_{2/3})O_3$-$0.3Ba(Zn_{1/3}Nb_{2/3})O_3$	1400/20h	Complex perovskite Trigonal P-3m1	34.5	97000	6.5	0	1097, 1098
2509	$0.5LaAlO_3$-$0.5SrTiO_3$+0.25 wt% B_2O_3	1430/2h	Perovskite Psuedocubic	34.5	43200	7	−11	1099
2510	$Ba_3Co_{.7}Zn_{.3}Nb_2O_9$+$V_2O_5$	1450	Perovskite Trigonal P-3m1	34.5	85000	4	0	1097
2511	$La_4SmCrTi_3O_{15}$	1650	Hexagonal P3m	34.5	17300	4.7	−38	1072
2512	MgO-$0.4Nb_2O_5$-$1.5TiO_2$		Composite	34.5	81300		−2	976
2513	$Ba_4LiNb_3O_{12}$+4 wt% BCB	950	Hexagonal $P6_3mc$	34.5	29600		12	1100
2514	$0.5CeO_2$-$0.5BaTi_4O_9$	1260/4h	Cubic flurite Fm3m+ Orthorhombic Pnmm	34.5	20050	4.2	2	646
2515	$NdTiSb_xTa_{1-x}O_6$ (x=0.2)	1480		34.6	14500	4.2	41	1101
2516	$ZnTa_2O_6$+0.5 wt% CuO	1230	Orthorhombic Pbcn	34.6	65500		5	1102
2517	$DyTiTaO_6$	1500	Aeschneite Orthorhombic	34.6	40100		7	583
2518	$BaTi_4O_9$+3 wt% MCAS glass	1200	Orthorhombic Pnmm	34.6	42050	7	14	1103
2519	$La_4PrCrTi_3O_{15}$	1575	Trigonal P3m	34.6	23700	4.8	−22	1072
2520	$0.09(0.5ZnNb_2O_6$-$0.5Zn_3Nb_2O_8)$-$0.91ZnTa_2O_6$	1350	Orthorhombic mixtures	34.7	41950		0	542
2521	$Bi[Sb_{1-x}(Nb_{0.992}V_{0.008})_x]O_4$ (x=0.4)		Monoclinic I2/c	34.7	16000		16	715
2522	$Sr(Eu_{1/2}Nb_{1/2})O_3$+0.5 wt% CeO_2	1575/4h	Complex perovskite Tetragonal	34.7	44000		−52	823

2523	$BaSr_2YNb_3O_{12}$	1450	Perovskite Trigonal R-3	34.7	26200		−8	990
2524	$La_5CrTi_3O_{15}$	1650	Trigonal P3m	34.8	34000	4.8	−35	1072
2525	$Sr_6Ta_4TiO_{18}$+3 wt% Bi_2O_3-B_2O_3 glass	1625/2h		34.8	5600		−19	895
2526	$BiNbO_4$+0.03 wt% CuV_2O_6	1050	Monoclinic P-1	34.9	9870		−3	1104
2527	$Ba_5SrTa_4TiO_{18}$	1550/4h		34.9	33000		65	895
2528	$Sr_3YNb_3O_{12}$	1450		34.9	15300		46	990
2529	0.09[0.5$ZnNb_2O_6$-0.5$Zn_3Nb_2O_8$]-*0.91*$ZnTa_2O_6$+0.5 wt% ZBS	1250	Composite	34.9	53900		−2	955
2530	Bi_2O_3-2.2MoO_3	620	Mixture	35.0	12000		−13	494
2531	$Ca[(Li_{1/3}Ta_{2/3})_{0.7}Ti_{0.3}]O_{3-d}$+3 wt% B_2O_3	1050	Perovskite Orthorhombic	35.0	22800	9.45	−4	765
2532	$Ca[(Li_{1/3}Nb_{2/3})_{0.9}Ti_{0.1}]O_{3-\delta}$+0.7 wt% B_2O_3	1000	Perovskite Orthorhombic	35.0	22100		−5	765
2533	$Ca[(Li_{1/3}Nb_{2/3})_{1-x}Ti_x]$ $O_{3-\delta}$ (x=0.1)	1150/3h	Perovskite Orthorhombic	35.0	27200		−2	752
2534	0.5TeO_2-0.5$SnTe_3O_8$	650	Mixture phases	35.0	8500		176	62
2535	$BaTi_4O_9$-0.1WO_3	1400	Orthorhombic Pmmn	35.0	52000	8	−1	171
2536	0.46$LaAlO_3$-0.54$SrTiO_3$+2 wt% B_2O_3	1460/2h	Perovskite Psuedo cubic	35.0	38000	7	−1	1105
2537	0.5$LaAlO_3$-0.5$SrTiO_3$		Psudocubic perovskite	35.0	27000		−18	1106
2538	$Ca[(Li_{1/3}Nb_{2/3})_{0.8}Ti_{0.2}]O_{3-d}$+5 wt% Bi_2O_3	900/3h	Perovskite Orthorhombic	35.0	11000		13	610
2539	$BaZrO_3$		Perovskite Cubic P23	35.0	8800			906
2540	$Ba_{10}Ta_{8-0.8x}Ti_xO_{30}$ (x=1.2)	1400/40h	Hexagonal perovskite	35.0	25760		64	920
2541	$Ca(Zn_{1/3}Nb_{2/3})O_3$		Perovskite	35.0	16,000	–	−43	609
2542	0.42$Zn_3Nb_2O_8$-0.58TiO_2	1250	Composite	35.0	48000		0	1092
2543	$Pb_{0.75}Ca_{0.25}(Al_{1/2}Nb_{1/2})O_3$		Perovskite	35.0	1100	4.7	133	996
2544	$Ca_{4.75}Ni_{0.25}Ta_2TiO_{12}$	1625	Perovskite Orthorhombic Pnma	35.0	34000	4.5	±0.5	230
2545	0.5CeO_2-0.25CaO-0.25TiO_2:6.5Cr_2O_3	1550	Composite	35.0	4300	4.4	0	488
2546	$Sr(Cr_{1/2}Nb_{1/2})O_3$	1600/4h	Perovskite Cubic Pm3m	35.0	6400		−80	823
2547	$Sr(Eu_{1/2}Nb_{1/2})O_3$	1575/4h	Perovskite Monoclinic $P2_1/n$	35.0	44000		−52	823
2548	0.9$Ba(Zn_{0.6}Co_{0.4})_{0.33}Nb_{0.67}]O_3-0.1Ba(Ga_{1/2}Ta_{1/2})O_3$		Perovskite	35.0	93550	3.06	0	1107
2549	BaO-4TiO_2-0.1WO_3		Composite	35.0	52400	6	0	171

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
2550	$Ba[(Zn_{0.3}Co_{0.7})_{1/3}Nb_{2/3}O_3$+0.25 wt% V_2O_5	1450/4h	Perovskite Trigonal P-3m1	35.0	85000		0	1108
2551	$Ba([(Co_{0.7}Zn_{0.3})_{1/3}Nb_{2/3}]O_3$ +0.4 wt% CeO_2	1450	Perovskite Trigonal P-3m1	35.0	84000		0	1097
2552	$0.9Ba[(Zn_{0.6}Co_{0.4})_{1/3}Nb_{2/3}]O_3$-$0.1Ba(Ga_{1/2}Ta_{1/2})O_3$		Perovskite	35.0	97600		0	1109
2553	$0.35Ba(Ni_{1/3}Nb_{2/3})O_3$-$0.65Ba(Zn_{1/3}Nb_{2/3})O_3$	1450/4h	Perovskite Trigonal P-3m1	35.0	25000		1	1110
2554	$BaO\text{-}Al_2O_3\text{-}4TiO_2$		–	35.0	5000	–	−15	1111
2555	$Ca_{4.75}Ni_{0.25}Ta_2TiO_{12}$	1625	Complex perovskite	35.0	34000	4.49	0	230, 1112
2556	$BaO\text{-}4TiO_2\text{-}0.1WO_3$	1400/2h in O_2	Composite	35.0	50400		−0.5	171
2557	$0.5LaAlO_3\text{-}0.5SrTiO_3$+0.25 wt% B_2O_3	1430	Psuedo Cubic perovskite	35.0	43200		−11	1099
2558	$0.46LaAlO_3\text{-}0.54SrTiO_3$+0.25 wt% B_2O_3	1460/2h	Psuedo Cubic perovskite	35.0	38000		−1	1113
2559	$La_5GaTi_3O_{15}$	1550	$A_5B_4O_{15}$ type cation deficient Perovskite	35.0	30300	3.09	−55	954
2560	$ZnTa_2O_6$	1200	Orthorhombic Pbcn	35.1	50600		10	1114
2561	$Zn_{0.9}Ti_{0.8\text{-}x}Sn_xNb_{2.2}O_8$ (x=0.05)	1120/6h	Orthorhombic Pbcn	35.1	49100		−28	1115
2562	$(1\text{-}x)La(Mg_{1/2}Ti_{1/2})O_3\text{-}xLa_{2/3}TiO_3$ (x=0.4)		Perovskite I2/a	35.1	6700	7.9		889
2563	$Sr(Cr_{1/2}Nb_{1/2})O_3$+0.2 wt% B_2O_3	1350/4h	Complex perovskite Cubic Pm3m	35.1	12500		−73	823
2564	$0.17Ba_5Nb_4O_{15}\text{-}0.83BaNb_2O_6$(hex)	1250/2h	Hexagonal perovskite	35.2	59300		0	1116
2565	$BaTi_{4.35}Zn_{0.55}O_{10.25}$	1260/6h		35.2	5000		36	1117
2566	$Ba_2Sr_3Ta_4O_{15}$	1575	Hexagonal perovskite	35.2	2400		−25	1090
2567	$0.05Ca(Y_{1/2}Nb_{1/2})O_3$-$0.95Ba((Y_{1/2}Nb_{1/2})O_3$	1550/4h	Complex perovskite	35.2	48300		1	763
2568	$PrTiSb_xTa_{1\text{-}x}O_6$ (x=0.2)	1480		35.2	12700	4.2	48	1101
2569	$Ca_4La_2Ti_{5\text{-}x}(Mg_{1/3}Nb_{2/3})_xO_{17}$ (x=4)	1540	Orthorhombic Pbnm	35.2	21300		−17	1118

2570	$Ca[(Li_{1/3}Nb_{2/3})_{0.8}Ti_{0.2}]O_{3-d}$+0.1 wt% LMZBS	1050	Complex perovskite Orthorhombic	35.2	22800		−4	792
2571	$Sr(Cr_{1/2}Nb_{1/2})O_3$	1600/4h	Complex perovskite	35.3	6400		−80	823
2572	$0.6Ba(Zn_{1/3}Nb_{2/3})O_3$-$0.4Ba(Co_{1/3}Nb_{2/3})O_3$	1450	Perovskite	35.5	86000	2	0	1119
2573	$Sr(Sm_{1/2}Nb_{1/2})O_3$+0.2 wt% B_2O_3	1350/4h	Complex perovskite Tetragonal	35.5	34500		−48	823
2574	$Ba(Tb_{1/2}Ta_{1/2})O_3$	1625	Complex perovskite Tetragonal	35.5	31900		−38	943
2575	$Ba(Tb_{1/2}Ta_{1/2})O_3$+0.5 wt% Nb_2O_5	1575	Complex perovskite Tetragonal	35.5	31900		−38	845
2576	$(Zr_{1-x}Sn_x)(Li_{1/4}Nb_{3/4})_{0.4}Ti_{0.6}O_4$ (x=0.1)			35.5	37800		−5	1043
2577	$0.8ZnTa_2O_6$-$0.2MgNb_2O_6$	1350/2h	Composite	35.6	65500		0	1120
2578	$La_4NdCrTi_3O_{15}$	1650	Trigonal P3m	35.6	19400	4.7	−34	1072
2579	$Dy(W_{0.5}Ti_{1.5})O_6$	1450	Orthorhombic Pnma Aeschynite type	35.6	20200		10	1121
2580	$Ba(Sc_{1/2}Nb_{1/2})O_3$	1700/12h	Perovskite	35.7	20000			1122
2581	$Ba_3ZnNb_{2-x}Sb_xO_9$ (x=0.125)		Perovskite Hexagonal P-3m1	35.7	56980	4.8	14	381
2582	$SmTaTi_{0.9}Zr_{0.1}O_6$			35.8	27730		15	671
2583	$Ba_3ZnNb_{2-x}Sb_xO_9$ (x=0.25)		Perovskite Trigonal P-3m1	35.8	35090	5.4	6	381
2584	$0.615BaTi_4O_9$-0.35ZnO-$0.3Nb_2O_5$+0.3 wt% Mn	1280/2h	Composite	35.8	50800		1	1123
2585	$Bi(Nb_{0.7}Ta_{0.3})O_4$	900	Orthorhombic Pnma	35.8	2200		−48	1124
2586	$Sr(Sm_{1/2}Nb_{1/2})O_3$+0.5 wt% CeO_2	1575/4h	Complex perovskite Tetragonal	35.8	32300		−47	823
2587	$Ba_{3-x}Sr_xLaNb_3O_{12}$ (x=3)	1430	Trigonal R-3m	35.8	44300		−9	1125
2588	BaO-0.6ZnO-$3TiO_2$	1180	Composite	35.8	21300		1	1126
2589	$Zn_{0.7}Co_{0.3}TiNb_2O_8$	1075/4h	Orthorhombic Pbcn	35.9	35100		0	1127
2590	$Ba_8Zn(Nb_{6-x}Sb_x)O_{24}$ (x=1.5)	1425		35.9	16900		9	503
2591	$0.5LaAlO_3$-$0.5SrTiO_3$	1680	Perovskite	35.9	108800	9.7	−21	832
2592	$(Zr_{0.8}Sn_{0.2})TiO_4$+0.2 wt% NiO	1280	Orthorhombic Pbcn	35.9	56700	9.2		1128
2593	$Ba_6Nb_4ZrO_{18}$	1625/2h	Trigonal R-3m	35.9	52000		25	895
2594	$(Ag_{0.5}Bi_{0.5})MoO_4$	580	Wolframite Monoclinic C12/m1	35.9	13000	7.5	−69	1129
2595	BaO-TiO_2-WO_3 (N-35)		Composite	36.0	50400	6	0	862

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
2596	$Ba_{1-x}Ca_x(Sc_{1/2}Nb_{1/2})O_3$		Perovskite	36-55	20000-55000			1122
2597	$Sr(La_{1/2}Nb_{1/2})O_3$+0.2 wt% B_2O_3	1350/4h	Complex perovskite Tetragonal	36.0	5200		−22	823
2598	$Ba(Nd_{1/2}Ta_{1/2})O_3$	1500	Complex perovskite	36.0	18000	7.3	2.9	590
2599	$Sr(Sm_{0.5}Ta_{0.5})O_3$+0.5 wt% Nb_2O_5+wt% TiO_2	1600/4h	Complex perovskite Tetragonal	36.0	22300		−38	859
2600	$Ba_2Ti_9O_{20}$+9 wt% BaB_2O_4	1050/2h	Monoclinic $P2_1/m$	36.0	12600		−2	1002
2601	$Ba(Zn_{1/3}Nb_{2/3})O_3$+5 mol% B_2O_3+CuO	875	Perovskite	36.0	19000		21	1130
2602	Bi_2TiTeO_8	840/10h		36.0	4700	5.7	41	1131
2603	$BaTi_4O_9$ -Citrate route	1250/10h	Orthorhombic Pnmm	36.0	50470		16	1132
2604	$Ba_{10}Ta_{7.04}Ti_{1.2}O_{30}$		Hexagonal $P6_3/mmc$	36.0	30000		52	464
2605	$BaTi_4O_9$-ZnO-Ta_2O_5+0.1 wt% Mn	1280	Orthorhombic Pnmm	36.0	45000	4.5	0	1133
2606	$Nd(Zn_{1/2}Ti_{1/2})O_3$		Perovskite	36.0	42300		−47	1134
2607	$TiTe_3O_8$	700/5h	Cubic Ia3	36.0	13600	4	133	53
2608	$0.25Zn_3Nb_2O_8$-$0.75TiO_2$	1200/2h	Composite	36.0	5160		4	632
2609	BaO-TiO_2-WO_3 (N-35)+5 wt% SiO_2	1200	Composite	36.0	4500	8.5		786
2610	$ZrTiO_4$ (polymer route)+0.5 wt% Hf	1600	Orthorhombic Pbcn	36.0	29700	5.3		1135
2611	$Ba(Yb_{1/2}Nb_{1/2})O_3$	1600	Complex perovskite	36.0	38100		2	1136
2612	$Nd_2Ti_2O_7$	1300	Monoclinic $P2_1$	36.0	16400		−118	1137, 1138
2613	$Ba(Gd_{1/2}Ta_{1/2})O_3$	1625/4h	Complex perovskite Tetragonal	36.0	3200		−18	943
2614	$Ba(Tb_{1/2}Ta_{1/2})O_3$	1625/4h	Complex perovskite Tetragonal	36.0	31900		−38	943
2615	$(Pb_{0.2}Ca_{0.8})(Ca_{1/3}Nb_{2/3})O_3$	1350	Perovskite	36.0	12500		−27	1139
2616	$0.6Ba(Zn_{1/3}Nb_{2/3})O_3$-$0.4Ba(Co_{1/3}Nb_{2/3})O_3$	1400	Perovskite Trigonal P-3m1	36.0	86000		0	1119
2617	$Sr(Sm_{1/2}Nb_{1/2})O_3$	1575/4h	Complex perovskite	36.0	32300		−47	823
2618	$Ca_4NiNb_2TiO_{12}$	1550	Perovskite Orthorhombic	36.0	31500	4.1	−30	230
2619	$Ca_{4.88}Co_{0.12}Ta_2TiO_{12}$	1625	Orthorhombic Pnma Perovskite	36.0	35000	4.49	0	230, 1112
2620	$Ca_5Ta_2Ti_{0.7}Zr_{0.3}O_{12}$	1650	Perovskite Pnma Orthorhombic	36.0	28000	4.4	0	662

2621	$La_4MgTi_3O_{12}$		Perovskite slab series	36.0	26000	5.8	−39	950
2622	$0.2CaTiO_3$-$0.8Ca(Mg_{1/3}Nb_{2/3})O_3$	1450	Composite	36.0	39000	7.7	−30	944
2623	Li_2O-Nb_2O_5-TiO_2+1 wt% B_2O_3	1100		36.0	10450	5.9	12	1140
2624	$5Li_2O$-Nb_2O_5-$5TiO_2$	1120		36.0	10500		12	760
2625	$Ba_2Ti_{9-x}[La_{0.5}Ta_{.5}]_xO_{20}$ (x=0.05)	1350	Monoclinic P-1	36.0	60000		12	1141
2626	$Ba_8Ta_{4+0.8x}Ti_{3-x}O_{24}$ (x=0=0.4)	1400/40h	$A_nB_{n-1}O_{3n}$ Hexagonal Perovskite	36.0	12000		–	1142
2627	$Ba_{7/12}La_{5/12}Zn_{1/3}Ti_{5/12}Nb_{3/12}O_3$	1400		36.0	1100	5.01	−14	919
2628	$Sr_3LaNb_3O_{12}$	1430	Hexagonal perovskite	36.0	45000		−9	1143
2629	$Ba(Gd_{1/2}Ta_{1/2})O_3$+0.5 wt% Nb_2O_5	1575	Complex perovskite Tetragonal	36.0	3150		−18	845
2630	$Ba[(Zn_{0.6}Mg_{0.4})Nb_{2/3}]O_3$		Perovskite Hexagonal P-3m1	36.0	94400		29	1144
2631	TiO_2+50 vol% ZBS glass	900	Composite	36.0	7500			1145
2632	$Ba(Ti_{0.5}Mn_{0.5})O_3$+5 wt% Bi_2O_3	1200	Perovskite	36.0	6800		25	956
2633	$0.6La_{1/2}Mg_{1/2}TiO_3$-$0.4La_{1/2}Na_{1/2}TiO_3$+1 wt% B_2O_3	1475	Composite	36.0	15500	8	−5	1146
2634	$Ba_8(Mg_{1-x}Zn_x)Nb_6O_{24}$ (x=0.2)			36.0	16950		57	1147
2635	$NdTiSb_xTa_{1-x}O_6$ (x=0.1)	1480/4h		36.0	17600	4.19	48	1101
2636	$Ba_4MgTi_{11}O_{27}$	1275	Monoclinic C2/m	36.1	19600		15	1148
2637	$Ba_8Zn(Nb_{6-x}Sb_x)O_{24}$ (x=0)	1425		36.2	10900		50	503
2638	$Ba_3LiNb_{0.5}Sb_{2.5}Ti_5O_{21}$	1200	Hexagonal $P6_3/mcm$	36.2	27000		20	923
2639	$Ba_8(Mg_{1-x}Zn_x)Nb_6O_{24}$ (x=1)			36.2	10900		50	1147
2640	$Sr_5NbTa_3O_{15}$	1575	Hexagonal perovskite P-3m1	36.2	6900	5.14	31	851
2641	$La_5GaTi_3O_{15}$	1600/30h	$A_5B_4O_{15}$ type cation deficient Perovskite	36.2	30300		−55	954
2642	$BaTi_4O_9$+5 mol% CuO+2 mol% B_2O_3	900/2h	Orthorhombic Pmmn	36.3	30500		28	1149
2643	$La_6MgTi_4O_{18}$	1625/2h	$A_6B_5O_{18}$ type perovskite	36.3	27350		−39	895
2644	$ZnTiNbTaO_8$	1140/6h	Orthorhombic Pbcn	36.3	67000		58	1150
2645	$CeTiSb_xTa_{1-x}O_6$ (x=0.05)	1480/4h		36.3	11500	3.99	63	1101
2646	$(Sr_{1-x}Ba_x)(Y_{1/2}Nb_{1/2})O_3$ (x=0.95)	1600/4h	Complex perovskite	36.3	48600		0	823
2647	$0.85BaTi_4O_9$-$0.15BaZn_2Ti_4O_{11}$+1 wt% CuO	1150/3h	Composie	36.4	62600		0	1151
2648	$CaTi_{0.3}(Al_{1/2}Nb_{1/2})_{0.7}O_3$+1 wt% Li_3NbO_4	1300/5h	Perovskite Orthorhombic	36.4	38900	7	−57	1152

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
2649	$Sr_6Nb_4ZrO_{18}$+2 wt% Bi_2O_3-B_2O_3 glass	1625/2h		36.4	21000		−8	895
2650	$5Li_2O$-$1Nb_2O_5$-$5TiO_2$+1 wt% B_2O_3+4 wt% ZnO	920	Multiphase	36.4	8800		4	1153
2651	$Nd_2Ti_2O_7$		Monoclinic $P2_1/n$	36.5	16400	9.1	−118	1137
2652	$Bi_2Mo_2O_9$+2 mol% Nb_2O_5	620	Monoclinic $P2_1/n$	36.5	14100		6	1154
2653	$Ba(Eu_{1/2}Ta_{1/2})O_3$+0.5 wt% Nb_2O_5	1575	Perovskite Tetragonal	36.5	41200		−16	845
2654	$Ba_2Ti_9O_{20}$+5 wt% B_2O_3	1200	Monoclinic $P2_1/n$	36.5	40200		38	1149
2655	BaO-TiO_2-ZnO+0.5 mol% $MnCO_3$+0.24 mol% SnO_2	1160/6h	Mixture phases	36.5	42000	4.7	2	1117
2656	$La_5Zn_{0.5}Ti_{3.5}O_{15}$	1500		36.5	23000	5.3	−39	954
2657	$BaTi_{4.35}Zn_{0.55}O_{10.25}$+0.5 mol% SnO_2	1160/6h		36.5	42000		2	1117
2658	$0.3TeO_2$-$0.7SnTe_3O_8$	660/2h	Mixture phases	36.5	8800		200	62
2659	$Sr(Nd_{1/2}Nb_{1/2})O_3$+0.2 wt% B_2O_3	1350/4h	Complex perovskite Cubic	36.5	22200		−42	823
2660	$Ca_5Ta_2TiO_{12}$+1 wt% Co_3O_4	1625/4h	Complex perovskite Orthorhombic Pnma	36.5	38500		6	1155
2661	$0.7SrTiO_3$-$0.3LaAlO_3$+10 wt% ZnO-B_2O_3	1100/3h		36.6	10800		−4	1156
2662	$Ba_3Ti_5Nb_6O_{28}$+3 wt% ZnB_2O_4	925	Monoclinic $P2_1/c$	36.6	19100		5	1157
2663	$Sr(La_{1/2}Nb_{1/2})O_3$+0.5 wt% CeO_2	1575/4h	Complex perovskite Cubic	36.6	4025		−20	823
2664	$0.6ZrO_2$-$0.4(Zn_{1/3}Nb_{2/3})O_2$-$0.2SnO_2$-$0.8TiO_2$	1220	Tetragonal	36.6	43200		−6	1158
2665	(5-x)BaO-xMgO-$2Nb_2O_5$ (x=0.5)	1200	Mixed phases	36.7	20000		61	1159
2666	$(Zr_{0.8}Sn_{0.2})TiO_4$+0.2 wt% MgO	1320	Orthorhombic Pbcn	36.7	60000	6.5		1160
2667	$Sr(Pr_{1/2}Nb_{1/2})O_3$+0.2 wt% B_2O_3	1350/4h	Complex perovskite Cubic	36.7	4600		−35	823
2668	$Ba_6Ti_{1-x}Sn_xNb_4O_{18}$ (x=0.5)	1500	Monoclinic $P2_1/c$	36.7	21400	5.7	34	982
2669	$ZnTiNb_2O_8$	1075/5h	Orthorhombic Ixiolite Pbcn	36.7	54000		−70	1161
2670	$Ba_4ZnTi_{11}O_{27}$	1200/2h	Monoclinic C2/m	36.8	16460		17	1082
2671	$Ba_3LaTa_3O_{12}$		$A_4B_4O_{12}$ Cation deficient perovskite	36.8	22000	6.4	−50	1162
2672	$NdTiSb_xTa_{1-x}O_6$ (x=0.05)	1480/4h		36.8	15700	4.13	48	1101

2673	$CaTi_{0.3}(Al_{1/2}Nb_{1/2})_{0.7}O_3$	1500/5h	Perovskite	36.8	29800	7	−61	1152
2674	$Ca(Fe_{1/2}Nb_{1/2})O_3$		Perovskite Orthorhombic Pbnm	36.8	15800	8.2	−93	1163, 1164
2675	$TbTiTaO_6$	1525	Orthorhombic	36.8	32300		10	583
2676	$BaO\text{-}ZnO\text{-}TiO_2$+0.5 mol% $MnCO_3$	1250		36.8	39000		−7	1117
2677	$Ba(Zn_{1/3}Nb_{2/3})O_3$+1 mol SnO_2 annealed at 1325	1450/4h	Perovskite Trigonal P-3m1	36.8	83200		29	1165
2678	$CeTiSb_xTa_{1-x}O_6$ (x=0.1)	1480/4h		36.9	10100	3.98	67	1101
2679	$Sr(Nd_{1/2}Nb_{1/2})O_3$+0.5 wt% CeO_2	1575/4h	Complex perovskite Cubic	36.9	20100		−40	823
2680	$La_4Ti_9O_{24}$	1350	Orthorhombic Fddd	37.0	24800	8.1	15	1137, 1138
2681	$Ba(La_{1/2}Ta_{1/2})O_3$	1625/4h	Complex perovskite	37.0	20950		−36	943
2682	$Ba(Eu_{1/2}Ta_{1/2})O_3$	1625/4h	Complex perovskite	37.0	41200		−16	943
2683	$Sr(La_{1/2}Nb_{1/2})O_3$	1575/4h	Complex perovskite	37.0	4000		−20	823
2684	$Sr(Nd_{1/2}Nb_{1/2})O_3$	1575/4h	Complex perovskite	37.0	20100		−40	823
2685	$0.9Ba(Co_{1/3}Nb_{2/3})O_3\text{-}0.1Ba(Y_{1/2}Nb_{1/2})O_3$	1380	Perovskite	37.0	25560			1087
2686	$0.35CaTiO_3\text{-}0.65LaAlO_3$	1600	Perovskite Rhombohedral	37.0	47000		−2	1166
2687	$0.42ZnNb_2O_6\text{-}0.58TiO_2$+10 wt% CuO	875	Composite	37.0	17000		−7	1167
2688	$Ba_2Ti_9O_{20}$(citrate route)	1300/2h	Monoclinic $P2_{1/}m$	37.0	57000	10.7	−6	1132
2689	$0.9Ba(Zn_{1/3}Nb_{2/3})O_3\text{-}0.1Ba(Ga_{1/2}Ta_{1/2})O_3$		Perovskite	37.0	93500	2.9	15	1107
2690	$Ba(Y_{1/2}Nb_{1/2})O_3$	1600	Complex perovskite	37.0	49600		15	1136
2691	$Zr_{0.8}Sn_{0.2}TiO_4$+1 mol% Sb_2O_5+0.35 wt% $B_2O_3\text{-}Li_2O$+slow cooled	1300/5h	Orthorhombic Pbcn	37.0	62000		–	1168
2692	$Ca_{4.18}Co_{0.82}Nb_2TiO_{12}$	1550	Complex perovskite Orthorhombic Pnma	37.0	30000	4.31	0	230, 1112
2693	$Ca_{4.85}Zn_{0.15}Ta_2TiO_{12}$	1625	Complex perovskite Orthorhombic Pnma	37.0	35000	4.15	0	230, 1112
2694	$Ca_{4.82}Mg_{0.18}Ta_2TiO_{12}$	1625	Complex perovskite Orthorhombic Pnma	37.0	36000	4.356	0	230, 1112

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
2695	$Zr_{0.8}Sn_{0.2}TiO_4$+2 wt% La_2O_3, 1 wt% NiO	1370/2h	Orthorhombic Pbcn	37.0	62000		−9	1169
2696	$Zr_{0.648}Sn_{0.332}TiO_4$+$La_2O_3$+NiO	1370/20h	Orthorhombic Pbcn	37.0	41500		–	1170
2697	3CaO-2MgO-Nb_2O_5-TiO_2	1340	Composite	37.0	19000	4.2	−20	230
2698	0.1TeO_2-$SnTe_3O_8$	670/2h	Cubic Ia3, mixture	37.0	9300		220	62
2699	$NdTiSb_xTa_{1-x}O_6$ (x=0.0)	1480/4h		37.0	11200	3.96	54	1101
2700	$(KBi)_{1/2}MoO_4$	630	Tetragonal $I4_1/a$	37.0	4000	7.5	117	677
2701	0.6$Sm(Co_{1/2}Ti_{1/2})O_3$-0.4$CaTiO_3$	1420	Perovskite	37.0	43000		1	1171
2702	$Ba_3Ti_5Nb_6O_{28}$	1250	Monoclinic $P2_1/c$	37.0	11400		−8	1172
2703	$Ba_8Li_2Nb_6O_{24}$		Hexagonal $P6_3mmc$	37.0	57500			952
2704	$Ba_4LiNb_{3-x}Ta_xO_{12}$ (x=0)	1275	Hexagonal perovskite $P6_3/mc$	37.0	57600		65	941
2705	$Ba_8(Mg_{1-x}Zn_x)Nb_6O_{24}$ (x=0.6)			37.0	14600		53	1147
2706	$La_5Ti_4FeO_{17}$	1500	Orthorhombic Pnnm	37.0	60000		−27	911
2707	$Ba(La_{1/2}Ta_{1/2})O_3$	1625	Complex perovskite Orthorhombic	37.1	18200		−35	943
2708	$Ba(La_{1/2}Ta_{1/2})O_3$+0.5 wt% Nb_2O_5	1575	Complex perovskite Orthorhombic	37.1	20950		−36	845
2709	$Ca[(Li_{1/3}Nb_{2/3})_{0.8}Ti_{0.2}]O_{3-d}$+0.5 wt% LMZBS	1125	Complex perovskite Orthorhombic	37.1	22100		2	792
2710	$Ba_{3-x}Sr_xLaNb_3O_{12}$ (x=2)	1415	Trigonal R-3m	37.1	33900		−18	1125
2711	$Ba_8(Mg_{1-x}Zn_x)Nb_6O_{24}$ (x=0.4)		Not available	37.1	16900		55	1147
2712	$Ca[(Li_{1/3}Nb_{2/3})_{0.8}Ti_{0.2}]O_{3-d}$+0.5 wt% LBS	1125	Complex perovskite Orthorhombic	37.2	21800		−5	792
2713	$Zr_{0.8}Sn_{0.2}TiO_4$+1 wt% V_2O_5	1300	Orthorhombic Pbcn	37.2	51000	7	−2	1173
2714	0.6$CaTiO_3$-0.4$NdAlO_3$	1450/10h	Perovskite Orthorhombic	37.2	40750		114	1174
2715	0.7$La(Mg_{1/2}Ti_{1/2})O_3$-0.3$CaTiO_3$	1600	Perovskite Monoclinic $P2_1/n$	37.2	15300	6.3	−54	932
2716	$Ba_5Nb_3TaO_{15}$	1435	Hexagonal	37.2	4500		35	1090
2717	$Ba(In_{1/2}Ta_{1/2})O_3$	1625	Perovskite	37.2	35500		25	943
2718	$Ba(Y_{1/2}Ta_{1/2})O_3$	1625	Perovskite	37.3	45900		120	943
2719	0.6$Ca(Al_{0.5}Nb_{0.5})O_3$-+0.5$SrTiO_3$	1500	Perovskite	37.3	25400		22	1175

2720	$0.6Li_2ZnTi_3O_8$-$0.4TiO_2$	1100	Spinel Cubic+rutile	37.3	11700		102	872
2721	$SnTe_3O_8$	660/2h	Cubic Ia3	37.3	10000		223	62
2722	$Bi_{12}(B_{0.5}P_{0.5})O_{20}$	780	Sillenite	37.4	850		−19	1176
2723	$BaTi_5O_{11}$+1 wt% CuO+4 wt% $BaCu(B_2O_5)$	925	Monoclinic $P2_1/n$	37.4	25500		33	1177
2724	$Ba(La_{1/2}Nb_{1/2})O_3$	1650	Perovskite	37.4	8000	7.2	−8	590
2725	Sr_2TiO_4 ($Sr_{n+1}Ti_nO_{3n+1}$)		Perovskite	37.4	8160	3.1	137	1358
2726	$Zn_{0.5}Ti_{0.5}NbO_4$	1100	Orthorhombic Ixiolite Pbcn	37.4	194000		−58	1179
2727	$Nd_4Ti_9O_{24}$	1300	Orthorhombic Fddd	37.5	24100	8	65	1137, 1138
2728	$Ca_3Mg_2Nb_4TiO_{17}$	1225		37.5	22500	3.9	−4	877
2729	$Sr(Pr_{/2}Nb_{1/2})O_3$+0.5 wt% CeO_2	1575/4h	Complex perovskite cubic	37.5	3250		−34	823
2730	$CeTiSb_xTa_{1-x}O_6$ (x=0.2)	1480		37.5	8400	4	53	1101
2731	$Ba_8Ti_3Nb_{4-x}Sb_xO_{24}$ (x=1.5)			37.5	38000		15	1178
2732	$0.425La_{0.97}Sm_{0.03}(Mg_{0.5}Sn_{0.5})O_3$-$0.575Ca_{0.8}Sm_{0.4/3}TiO_3$	1600		37.5	40300		2	1180
2733	$Bi_2Mo_2O_9$+3 mol%Y_2O_3	640	Monoclinic $P2_1/n$	37.5	14750			1176
2734	$ZnTa_2O_6$	1350	Tri-α PbO_2Orthorhombic Pbcn	37.6	65200		9	600
2735	$Ba(Sm_{1/2}Ta_{1/2})O_3$	1625	Complex perovskite Tetragonal	37.6	15000		−10	943
2736	$Ba_5SrNb_4ZrO_{18}$	1600/2h	$A_6B_5O_{18}$ type perovskite Trigonal R-3m	37.6	36000		68	895
2737	$Bi_{12}SiO_{20}$	850	Cubic I23	37.6	8100		−20	1176
2738	Beta-Bi_3SbO_7	960	Orthorhombic	37.6	5080		−120	1181
2739	$Ca_5Ta_2TiO_{12}$+1 wt% NiO	1625/4h	Complex perovskite Orthorhombic Pnma	37.6	38000		7	1155
2740	$Ba(Sm_{1/2}Ta_{1/2})O_3$+0.5 wt% Nb_2O_5	1575	Complex Perovskite Tetragonal	37.6	16000		−10	845
2741	$CeTiSb_xTa_{1-x}O_6$ (x=0.15)	1480/4h		37.7	9300	3.98	64	1101
2742	$Ca_5Ta_2TiO_{12}$+0.5 wt% CuO	1625/4h	Complex perovskite Orthorhombic Pnma	37.7	38000		12	1155
2743	$La_6ZnTi_4O_{18}$	1600/4h	$A_6B_5O_{18}$ type perovskite	37.7	21850		−37	895

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
2744	$(Zr_{0.8}Sn_{0.2})TiO_4$+1 wt% ZnO, 0.25 wt% WO_3	1340	Orthorhombic Pbcn	37.8	61000	7	−4	1182
2745	$Ba_2La_2TiTa_2O_{12}$	1520	Trigonal P-3m1 perovskite	37.8	36200	5.7	−52	1183
2746	$GdTiTaO_6$	1540	Aeschneite Orthorhombic	37.9	12900		11	583
2747	$Gd(W_{0.5}Ti_{1.5})O_6$	1375	Orthorhombic Pnma Aeschynite type	37.9	2600		−7	1121
2748	$Ca_5Ta_2TiO_{12}$+1 wt% ZnO	1625/4h	Complex perovskite Orthorhombic Pnma	37.9	39000		5	1155
2749	$Ca_{5-x}Zn_xNb_4TiO_{17}$ (x=0.2)	1340	$A_nB_n3_{n+2}$ type Perovskite $P2_1/C$	37.9	22000		−62	1184
2750	$Ba_2Ti_3Nb_4O_{18}$	1220	Monoclinic $P2_1/c$	38.0	23700	4.8	−3	1185
2751	$Zr_{0.8}Sn_{0.2}TiO_4+B_2O_3$		Orthorhombic pbcn	38.0	61500			1186
2752	$Bi_2Mo_2O_9$	620	Monoclinic $P2_1/n$	38.0	12500		31	494
2753	$Ba_2Ti_9O_{20}$ (Hydrothermal)	150	Monoclinic $P2_1/m$	38.0	1200	5.6	6	1187
2754	$Ca(Zr_xTi_{1-x})O_3$ (x=0.7)	1470/15h	Perovskite	38.0	2900	3.9	168	916
2755	$0.95Ba(Zn_{1/3}Nb_{2/3})O_3$-$0.05Ba(Ga_{1/2}Ta_{1/2})O_3$		Perovskite	38.0	102950	2.9	19	1107
2756	$Bi_{12}GeO_{20}$	850	Cubic I23 Sillenite	38.0	7800		−31	1176
2757	$Ba(Sm_{1/2}Ta_{1/2})O_3$	1625/4h	Complex perovskite	38.0	15000		−10	943
2758	$Ba(Ho_{1/2}Nb_{1/2})O_3$	1600	Complex perovskite	38.0	21600		−11	1136
2759	$Sr(Pr_{1/2}Nb_{1/2})O_3$	1575/4h	Complex perovskite	38.0	3300		−34	823
2760	$Ca_3Nb_2O_8$		Tetragonal P4/nnc	38.0	7100	5.9	113	864
2761	$Zr_{0.8}Sn_{0.2}TiO_4$		Orthorhombic Pbcn	38.0	62000	4	0	1188
2762	$0.24Li_2O$-$0.71Nb_2O_5$-$0.05TiO_2$	1350	M phase	38.0	40000		−99	760
2763	$Zr_{0.8}Sn_{0.2}TiO_4$ sol-gel derived	1300	Orthorhombic Pbcn	38.0	55000	6	1	1189
2764	$0.5LaCa_{0.5}Zr_{0.5}O_3$-$0.5SrTiO_3$	1575	Composite	38.0	7000	3.8	8	522
2765	BaO-$2CeO_2$-$3TiO_2$	1250	Composite	38.0	7200		159	909
2766	$Ca_5Ta_2TiO_{12}$	1625	Complex perovskite Orthorhombic Pnma	38.0	33000	4.2	10	1190, 1191
2767	$Ca_5Ta_2TiO_{12}$+0.2 wt% Al_2O_3-B_2O_3-SiO_2	1550	Complex perovskite Orthorhombic Pnma	38.0	38000		8	1191

2768	$Ca_5Ta_2TiO_{12}$+0.1 wt% $2MgO\text{-}Al_2O_3\text{-}5SiO_2$	1550	Complex perovskite Orthorhombic Pnma	38.0	40000		5	1191
2769	$Ba(Zn_{1/3}Nb_{2/3})_{0.9}Zr_{0.1}O_3$	1400	Perovskite Cubic Pm3m	38.0	61000	10	15	1192
2770	$Ca_5Ta_2TiO_{12}$+0.5 wt% MgO	1625/4h	Complex perovskite Orthorhombic Pnma	38.0	40000		6	1155
2771	$La_{0.42}Ca_{0.58}[Ca_{0.05}Mg_{0.16}Ti_{0.79}]O_3$		Perovskite	38.0	20000	5.3	25	950
2772	$Ca_{(1-x)}Y_xTi_{1-x}Al_xO_3$ (x=0.3)		Perovskite Orthorhombic	38.0	14200		−14	1193
2773	$Ba_{0.2}Sr_{0.71}(Zr_{0.951}Ti_{0.039}Ta_{0.01})O_3$		Perovskite Orthorhombic	38.0	1700		0	1194
2774	$Ba_{0.29}Sr_{0.71}(Zr_{0.973}Ti_{0.027})O_3$		Perovskite Orthorhombic	38.0	2000		−40	1194
2775	$Ba(Zn_{1/3}Nb_{2/3})O_3$+1 mol% WO_3	1450	Perovskite Cubic Pm3m	38.0	95150		39	1165
2776	$0.4Nd_{1525/4}Yb_{0.04}(Mg_{0.5}Sn_{0.5})O_3\text{-}0.6Ca_{0.08}Sr_{0.2}TiO_3$+1.25 wt% B_2O_3	1525/4h	Composite	38.0	68600		2	1195
2777	$Ba_2Ti_3Nb_4O_{18}$		Monoclinic $P2_1/c$	38.1	14200		−11	1196
2778	$Ba_3Ti_5Nb_6O_{28}$+$BaCu(B_2O_5)$	925	Monoclinic $P2_1/c$	38.2	19200		12	1172
2779	$Ca[(Li_{1/3}Nb_{2/3})_{0.8}Ti_{0.2}]O_{3\text{-}d}$+0.2 wt% LBS	1125	Complex perovskite Orthorhombic	38.2	21500		−2	792
2780	$Ba_4NdTiNb_3O_{15}$	1430/3h	Hexagonal perovskite	38.2	18700	5.4	12	1352
2781	$BaO\text{-}ZnO\text{-}TiO_2$	1250		38.2	5000		36	1117
2782	$Sr_{1-x}Ca_x[(Li_{1/4}Nb_{3/4})_{1-y}Ti_y]O_3$		Perovskite	38.2-45.8	35000		30 to -70	1197
2783	$0.7La(Mg_{1/2}Ti_{1/2})O_3\text{-}0.3SrTiO_3$		Perovskite Pbnm	38.3	10550	6.6		978
2784	$0.87La(Mg_{1/2}Ti_{1/2})O_3\text{-}0.13Ca_{0.8}Sr_{0.2}TiO_3$+0.5 wt% B_2O_3	1475	Composite	38.3	67000	8	0	1198
2785	$Zn_{0.97}Co_{0.03}Ta_2O_6$		Orthorhombic Pbcn	38.3	109200		10	1077
2786	$PrTiSb_xTa_{1-x}O_6$ (x=0.15)	1480/4h	Not available	38.3	12300	4.05	60	1101
2787	$0.4Nd(Mg_{0.4}Zn_{0.1}Sn_{0.5})O_3\text{-}0.6Ca_{0.8}Sr_{0.2}TiO_3$	1350/4h	Composite	38.3	35000		−5	1199
2788	$Ba(Zn_{1/3}Nb_{2/3})O_3$+1 mol%WO_3 annealed at 1325	1450/4h	Perovskite Cubic Pm3m	38.4	95150		38	1165

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
2789	$Ba(Pr_{1/2}Ta_{1/2})O_3$	1625	Complex perovskite Orthrohombic	38.5	42800		−8	943
2790	$Sm(Nb_{0.25}Ta_{0.75})TiO_6$			38.5	22100		26	671
2791	$Zn_{0.95}Co_{0.05}Ta_2O_6$		Orthorhombic Pbcn	38.5	112000		11	1077
2792	$(Zn_{0.95}Mn_{0.05})Ta_2O_6$	1325	Orthorhombic Pbcn	38.5	92700		9	1200
2793	$Ba(Pr_{1/2}Ta_{1/2})O_3$+0.5 wt% Nb_2O_5	1575	Complex perovskite Orthorhombic	38.5	47150		−39	845
2794	$(Sm_{0.5}Y_{0.5})(Ti_{1.5}W_{0.5})O_6$	1400/10h	Not available	38.5	36900		−6	1201
2795	$Eu(W_{0.5}Ti_{1.5})O_6$	1375	Orthorhombic Pnma Aeschynite type	38.6	30500		3	1121
2796	$0.5Ba(Y_{1/2}Nb_{1/2})O_3$-$0.5Ba(Ca_{1/9}Y_{3/9}Nb_{5/9})O_3$		Perovskite	38.6	17400	8.1		1202
2797	MWF-38	1360	Composite	38.6	44500		1.3	510
2798	$Bi_{12}PbO_{19}$		Cubic I23 sillenite	38.6	2900		−84	1176
2799	$Ca[(Li_{1/3}Nb_{2/3})_{1-x}Ti_x]O_3$ (x=0.2)	1150/3h	Perovskite	38.6	26100		0	752
2800	$Ba_3Ti_5Nb_6O_{28}$+3 wt% B_2O_3+1 wt% CuO	900/2h	Monoclinic $P2_1/c$	38.6	29800		5	1203
2801	$Ca_5Ta_2TiO_{12}$+0.5 wt% Al_2O_3	1625/4h	Complex perovskite Orthorhombic Pnma	38.6	36000		6	1155
2802	$Ca(Fe_{1/2}Nb_{1/2})O_3$	1250/3h	Perovskite Orthorhombic Pbnm	38.6	1830	5.9	−107	1164
2803	$Ba(Nd_{1/2}Ta_{1/2})O_3$+0.5 wt% Nb_2O_5	1575	Complex perovskite Tetragonal	38.7	12050		−4	845
2804	$Zr_{0.8}Sn_{0.2}TiO_4$+1 wt% ZnO+0.2 wt% B_2O_3	1150/3h	Orthorhombic Pbcn	38.7	61500			1186
2805	$PrTiSb_xTa_{1-x}O_6$ (x=0.1)	1480/4h		38.7	12800	4.02	64	1101
2806	$Bi_4B_2O_9$	660	Monoclinic $P2_1/c$	38.8	2620		−203	287
2807	$Ba(Eu_{1/2}Ta_{1/2})O_3$	1625	Complex perovskite	38.8	36200		−10	943
2808	$Ba(Dy_{1/2}Nb_{1/2})O_3$	1600	Complex perovskite	38.9	20600		−4	1136
2809	$Zr_{0.8}Sn_{0.2}TiO_4$	1600/4h	Orthorhombic Pbcn	38.9	51500		0.7	1204
2810	$Ba_{3-x}Sr_xLaNb_3O_{12}$ (x=1.5)	1405	Hexagonal perovskite R-3m	38.9	25800		−35	1125

2811	$ZnTiNb_2O_8$-0.8TiO_2+2 wt% $BaCu(B_2O_5)$	950	Orthorhombic Pbcn	38.9	14500	4.71	0	1205
2812	$Ba(In_{1/2}Nb_{1/2})O_3$+MoO_3 additive	1600	Complex perovskite	39.0	30700		17	1136
2813	$Ba_5Nb_4O_{15}$ ($A_nB_{n-1}O_{3n}$)	1380	Hexagonal perovskite P-3m1	39.0	23700	4.7	78	325
2814	$Ba_5Nb_4O_{15}$+6.3 vol% $BaNb_2O_6$+3 wt% B_2O_3	925/2h	Composite	39.0	18700		0	1206
2815	(1-x)$Ba_3(ZnNb_2)O_9$-x$Ba_3W_2O_9$ (x=0.007)	1380	Perovskite	39.0	118000		21	1207
2816	$Ca[(Li_{1/3}Nb_{2/3})_{1-x}Ti_x]$ $O_{3-\delta}$ (x=0.15)	1150/3h	Perovskite	39.0	26100		0	752
2817	$Ba(Tb_{1/2}Nb_{1/2})O_3$	1600	Complex perovskite	39.0	52400		−2	1136
2818	$Ba_3Ti_5Ta_6O_{28}$	1430		39.0	4000	5.3	30	1208
2819	$Ca_4SrTa_2TiO_{12}$	1625	Complex Perovskite Orthorhombic Pnma	39.0	21000	3.59	12	1209
2820	$Ba(Mn_{1/3}Nb_{2/3})O_3$		Trigonal P-3m1 Perovskite	39.0	9300	9.3	27	787
2821	$Ba_4LaSnNb_3O_{15}$ ($A_5B_4O_{15}$)	1480/4h	Hexagonal perovskite	39.0	14800	5.9	−29	1210
2822	(1-x)$LaMg_{1/2}Ti_{1/2}$-x$La_{2/3}TiO_3$ (x=0.48)		Perovskite	39.0	3800	4.6	23	950
2823	$Li_{0.774}Zr_{0.057}NbO_3$	1150	Orthorhombic Pnma	39.0	4500	6	−17	1070
2824	$Ca_5Ta_2TiO_{12}$+0.1 wt% 2MgO-Al_2O_3-5SiO_2	1600	Perovskite Orthorhombic Pnma	39.0	40000	5	8	1211
2825	$Ca_5Ta_2TiO_{12}$+0.1 wt% B_2O_3-Al_2O_3-5SiO_2	1600	Complex perovskite Orthorhombic Pnma	39.0	38000	5	7	1211
2826	$Ca_5Ta_2TiO_{12}$+0.1 wt% SiO_2	1600	Complex perovskite Orthorhombic Pnma	39.0	35000	5	9	1211
2827	$Ca_5Ta_2TiO_{12}$+1 wt% SnO_2	1625/4h	Complex perovskite Orthorhombic Pnma	39.0	35500		2	1155
2828	$Ca_5Ta_2TiO_{12}$+1 wt% Cr_2O_3	1625/4h	Complex perovskite Orthorhombic Pnma	39.0	40500		13	1155
2829	$Ca_5Ta_2TiO_{12}$+1 wt% In_2O_3	1625/4h	Complex perovskite Orthorhombic Pnma	39.0	37000		2	1155
2830	$SrTiO_3$-$LaAlO_3$		Perovskite	39.0	60000		0	1212

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
2831	$Sr(Sm_{0.5}Ta_{0.5})O_3$+0.5 wt% Nb_2O_5+2 wt% TiO_2	1600/4h	Complex perovskite Tetragonal	39.0	11600		−20	859
2832	$BaMg_6Ti_6O_{19}$	1450	Hexagonal $P6_3/mmc$	39.0	20000	2	370	1213
2833	$Ba_2Ti_9O_{20}$	1350/3h	Monoclinic $P2_1/m$	39.0	32000	2		1214, 1215
2834	$Ba_5Nb_4O_{15}$+3 wt% B_2O_3	925	Perovskite Hexagonal P-3m1	39.0	18700		0	1206
2835	$Bi_2Te_2O_8$(oxygen atm)	650/10h	Monoclinic C2/c	39.0	23000		−43	1216
2836	$0.9BiNbO_4$-$0.1ZnNb_2O_6$+$0.8CuV_2O_6$	900	Mixture phases	39.0	31000		−10	1217
2837	$Ba_{9/12}La_{3/12}Zn_{1/3}Ti_{3/12}Nb_{5/12}O_3$	1400		39.0	1500	5.46	−42	919
2838	$Sr_2La_2TiNb_2O_{12}$	1450	Hexagonal perovskite	39.0	40600		−5	1143
2839	$Sr_{4-m}La_mTi_{m-1}Ta_{4-m}O_{12}$ (m=3)	1600		39.0	42000		−8	975
2840	$0.6La(Mg_{1/2}Ti_{1/2})TO_3$-$0.4Ca_{0.6}Nd_{0.8/3}TiO_3$+0.5 wt% B_2O_3	1475	Composite	39.0	41000	8	−3	1218
2841	$Bi_{11.8}SiO_{19.7}$	825/4h	Cubic I23	39.0	74000		−14	1219
2842	$Bi_4B_2O_9$	660	Monoclinic $P2_1/c$	39.0	2600		−203	287
2843	$Ba(Dy_{1/2}Ta_{1/2})O_3$	1625	Complex perovskite	39.1	18200		−48	943
2844	$0.8BaZn_2Ti_4O_{11}$-$0.2BaNd_2Ti_4O_{12}$	1250	Composite	39.1	37850		−9	1220
2845	$(Zr_{0.8}Sn)TiO_4$+2 wt% ZST nano	1300/3h	Orthorhombic Pbcn	39.2	72900		–	1221
2846	$Sr_{1.6}Ca_{0.4}TiO_4$	1600	Tetragonal I4/mmm	39.2	8100	3	195	1222
2847	(5-x)BaO-xMgO-$2Nb_2O_5$ (x=1)+1 wt% CuO	1200	Composite	39.2	43800		38	1159
2848	$Sr_2La_4Ti_5O_{18}$	1625/2h	$A_6B_5O_{18}$ type perovskite	39.2	27350		20	895
2849	$Sm(Nb_{0.5}Ta_{0.5})TiO_6$			39.3	19600		33	671
2850	$Ca_5Ta_2TiO_{12}$+1 wt% Sb_2O_3	1625/4h	Complex perovskite Orthorhombic Pnma	39.3	36800		7	1155
2851	$Ba_2Ti_9O_{20}$+1.64 mol%SnO_2	1390/6h in O_2	Monoclinic P-1	39.3	38400		–	1223
2852	$Ba_3LaTa_3O_{12}$	1500	$A_nB_{n-1}O_{3n}$ perovskite Trigonal R3m	39.4	26800	6	−46	1224

2853	$Bi_{12}MnO_{20-d}$	720	Cubic I23 Sillimanite	39.4	800		−35	1176
2854	$PrTiSb_xTa_{1-x}O_6$ (x=0.05)	1480/4h		39.4	14800	4.001	65	1101
2855	$Sm(W_{0.5}Ti_{1.5})O_6$	1350	Orthorhombic Pnma Aeschynite type	39.4	35500		−1	1121
2856	$5.7Li_2O$-Nb_2O_5-$7.3TiO_2$	1100	M phase	39.5	16200		65	1225
2857	$CeTiSb_xTa_{1-x}O_6$ (x=0)			39.5	11400	3.81	60	1101
2858	$Ba_{3-x}Sr_xLaNb_3O_{12}$ (x=1)	1400	Perovskite Trigonal R-3m	39.5	22600		−56	1125
2859	$Ba_{1-x}La_x[Zn_{(1+x)/3}Nb_{(2-x)/3}]O_3$ (x=0)	1350/4h		39.5	112280		19	1226
2860	$Ba_2Ti_9O_{20}$+1.64 mol% ZrO_2	1390/6h O_2	Monoclinic $P2_1/m$	39.5	41700		2	1227
2861	$Ba_5SrNb_4ZrO_{18}$	1600/4h	Trigonal R-3m	39.5	36000		68	895
2862	$Ba[Zn_{1/4}Ti_{1/4}Ta_{1/2}]O_3$	1500	Perovskite cubic	39.6	15000	7.4		1228
2863	$0.6La_{2/3}TiO_3$-$0.4LaAlO_3$	1400/33h	Perovskite Orthorhomic	39.6	42200	6	−15	1096
2864	$Ba(Ho_{1/2}Ta_{1/2})O_3$	1625	Complex perovskite	39.6	21900		130	943
2865	$PrTiSb_xTa_{1-x}O_6$ (x=0.0)	1480/4h		39.6	12500	3.97	56	1101
2866	$0.95Ba(Zn_{1/3}Nb_{2/3})O_3$-$0.05BaZrO_3$+1 wt% CuO	1360/2h	Perovskite cubic Pm3m	39.7	70000	7	17	1229
2867	$Ba(Sm_{1/2}Nb_{1/2})O_3$	1500	Complex perovskite	39.7	21500	7.1	21	590
2868	$(1-x)La(Mg_{1/2}Ti_{1/2})O_3$-$xLa_{2/3}TiO_3$ (x=0.45)		Perovskite I2/a	39.7	5800	7.6		889
2869	$Ba(Yb_{1/2}Ta_{1/2})O_3$	1625	Complex perovskite	39.7	31700		112	943
2870	$0.65CaTiO_3$-$0.35Sm_{0.9}Nd_{0.1}AlO_3$	1415/3h	Orthorhombic Perovskite	39.7	50000		−7	1230
2871	$Ba_6Ti_{1-x}Sn_xNb_4O_{18}$ (x=0.25)	1480	Hxagonal R-3m	39.8	19800	5.5	46	982
2872	$GdTiTaO_6$	1540		39.9	12900		11	583
2873	$Ba(Gd_{1/2}Nb_{1/2})O_3$	1600	Complex perovskite	40.0	5700		5	1136
2874	$Ca_5Nb_{0.5}Ta_{1.5}TiO_{12}$	1600	Complex perovskite Orthorhombic Pnma	40.0	31500		19	1231
2875	$Ba(Eu_{1/2}Nb_{1/2})O_3$	1600	Complex perovskite	40.0	40200		7	1136
2876	$Ba_3Ti_5Nb_3Ta_3O_{28}$	1375		40.0	8000	4.8	9	1208
2877	$Ba_5Nb_4O_{15}$	–	Trigonal perovskite P-3m1	40.0	53000		78	1232-1234
2878	$Ca_4ZnNb_2TiO_{12}$	1550	Perovskite Orthorhombic Pnma	40.0	30500	4.2458	−37	230

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
2879	$Sr_5Nb_4O_{15}(A_nB_{n-1}O_{3n})$	1400	Trigonal P-3c1 perovskite	40.0	19400	4.84	55	325
2880	$Ca(Fe_{1/2}Nb_{1/2})O_3$	1500/6h	Complex perovskite Orthorhombic Pbnm	40.0	20000		−76	609
2881	$Ca[(Li_{1/3}Nb_{2/3})_{0.8}Ti_{0.2}]O_{3-\delta}$	920	Orthorhombic perovskite	40.0	20500	8	5	1235
2882	$Ca[(Li_{1/3}Nb_{2/3})_{0.8}Ti_{0.2}]O_{3-\delta}$+12 wt% B_2O_3-ZnO-SiO_2-PbO frit glass	900	Composite	40.0	12500		−8	1236
2883	$Sr(Zn_{1/3}Nb_{2/3})O_3$		Perovskite Cubic Pm3m	40.0	36800	9.2	−39	787
2884	$0.3Sr(Eu_{1/2}Nb_{1/2})O_3$-$0.7Sr(Fe_{1/2}Nb_{1/2})O_3$	1600/4h	Complex perovskite	40.0	22600		−4	823
2885	$Ba[(Zn_{0.8}Co_{0.2})_{1/3}Nb_{2/3}]O_3$	1410	Perovskite Cubic Pm3m	40.0	50135		18	1130
2886	$Ba(Zn_{1/3}Nb_{2/3})O_3$	1390	Perovskite Cubic Pm3m	40.0	87000		30	787, 1237
2887	$Ba_{0.3}Sr_{0.7}(Zn_{1/3}Nb_{2/3})O_3$	1500/1h	Perovskite Cubic Pm3m	40.0	30500	10	−5	1238
2888	$0.7Ca(Mg_{1/3}Nb_{2/3})O_3$-$0.3CaTiO_3$		Perovskite	40.0	27900	3.8	−15	1238
2889	$(Zr,Sn)TiO_4$	1600	Orthorhombic Pbcn	40.0	53000	10	0	1240
2890	$Ba_8Ta_{4+0.8x}Ti_{3-x}O_{24}$ (x=0)	1400/40h	$A_nB_{n-1}O_{3n}$ hexagonal Perovskite P63/mcm	40.0	12960			920
2891	$0.6La_{2/3}TiO_3$-$0.4LaAlO_3$(oxygen)	1400/33h	Perovskite Orthorhombic	40.0	50800	6	−15	1096
2892	$Ba_{0.75}Sr_{0.25}(Zn_{1/3}Ta_{2/3})_{0.94}Ti_{0.06}O_3$	1400	Perovskite	40.0	65000	10	−13	1194
2893	$Ba_5Nb_4O_{15}$+0.3 wt% ZnB_2O_4 glass	900	Hexagonal Perovskite	40.0	12100		48	1241
2894	Ba-Nd-Sm-Bi-Ti-O+9 wt% BaO-B_2O_3-SiO_2	950/2.5h	Composite	40.0	3000			1242
2895	$ZnNb_2O_6$-$1.8TiO_2$+4 wt% $BaCu(B_2O_5)$	950/4h	Composite	40.0	11000		2	626
2896	$Bi(V_{0.008}Nb_{0.992})O_4$	830	Orthorhombic Pnma	40.0	18500			1243
2897	$La(Mg_{0.3}Ti_{0.5})O_3$+15 mol% Bi_2O_3	1325	Composite	40.1	60200		70	1244
2898	$Ca_5Ta_4TiO_{17}$	1525	Monoclinic $P2_1/c$	40.1	16450	4.22	−54	877, 1245
2899	$Ba_3Ti_5Nb_6O_{28}$+2 wt% B_2O_3+2 wt% CuO	900/2h	Monoclinic $P2_1/c$	40.2	32200		5	461
2900	$La_6MgTi_4O_{18}$	1625/2h		40.2	35000		−39	895
2901	$Ba_5Nb_4O_{15}$+1.5 wt% $BaCu(B_2O_5)$		Hexagonal perovskite	40.2	28600		60	1246
2902	BaO-CeO_2-$3TiO_2$	1300	Composite	40.3	19900		22	1247

2903	$Ba(Zn_{1/3}Nb_{2/3})O_3$+1 mol% ZrO_2 annealed at 1325	1450/4h	Complex perovskite trigonal	40.3	77800		26	1165
2904	$Ba_3Ti_5Nb_6O_{28}$+1 wt% B_2O_3+3 wt% CuO	900/2h	Monoclinic $P2_1/c$	40.3	32500		9	461
2905	2.5ZnO-0.2SnO_2-4.8TiO_2-2.5Nb_2O_5+4 wt% $BaCu(B_2O_5)$	900	Composite	40.4	19000		−1	1248
2906	5.7Li_2O-Nb_2O_5-7.3TiO_2+1 wt% B_2O_3	900	M phase+Li_2TiO_3	40.5	13900		42	1225
2907	$ZnTi(Nb_{1-x}Ta_x)_2O_8$ (x=0.8)	1200/2h	Orthorhombic Pbcn	40.5	41000		0	1249
2908	$Ca_4La_2Ti_{5-x}(Mg_{1/3}Nb_{2/3})_xO_{17}$ (x=3)	1540	Orthorhombic Pbnm	40.5	19100		1	1118
2909	$BaTi_5O_{11}$+1 wt% CuO	1100	Monoclinic $P2_1/n$	40.5	44500		39	1177
2910	$Ca_4MgNb_4TiO_{17}$	1250		40.6	18250		1.5	877
2911	$Ga_{0.5}Ta_{0.5}TiO_4$	1400	Tetragonal P42/mnm	40.6	17500		110	1250
2912	$BiNb_{0.6}Sb_{0.4}O_4$	920	Orthorhombic Pnna	40.7	9500		−31	1251
2913	$Zr_{0.8}Sn_{0.2}TiO_4$+1 wt% ZnO+1 mol% Sb_2O_5	1400/5h	Orthrhombic Pbcn	40.8	60900			1252
2914	5.5Li_2O-Nb_2O_5-7.5TiO_2+1 wt% B_2O_3	875		40.8	15500	5.78	50	1253
2915	$La_6ZnTi_4O_{18}$	1600/4h		40.8	21900		−37	895
2916	$Ni_{0.35}Zn_{0.65}TiNb_2O_8$	1100/6h	–	40.9	40900		1	1254
2917	0.8ZrO_2-0.4$(Zn_{1/3}Nb_{2/3}O_2$-0.8TiO_2	1320/3h		40.9	43300		−4	1255
2918	5Li_2O-1Nb_2O_5-5TiO_3+1 wt% B_2O_3	900		41.0	9880		43	1256
2919	$Ba_2Ti_3Nb_4O_{18+}$ 1.5 wt% $MnCO_3$-CuO+0.5 wt% LBS	900/2h	Composite	41.0	15000	4.8	4	1185
2920	$Ba_{1/2}La_{1/2}Zn_{1/3}Ti_{1/2}Nb_{1/6}O_3$	1400		41.0	1550	5.04	18	919
2921	$SrLa_3Ti_2NbO_{12}$	1480	Hexagonal perovskite	41.0	33600		3	1143
2922	$Ba_2Ti_9O_{20}$:Mn		Monoclinic $P2_1/m$	41.0	45000	9	2	1254
2923	$Ba(Zn_{1/3}Nb_{2/3})O_3$+1 mol% CeO_2 annealed at 1325	1450/4h	Complex perovskite Cubic Pm3m	41.0	69500		41	1165
2924	$Ca_{4.35}Mg_{0.65}Nb_2TiO_{12}$	1550	Orthorhombic perovskite Pnma	41.0	33000	4.1	0	230
2925	$Ba(Zn_{1/3}Nb_{2/3})O_3$ Annealed in N_2	1500	Perovskite cubic Pm3m	41.0	90000		4	787
2926	$(Ti_{0.8}Sn_{0.2})Te_3O_8$	700/5h	Cubic Ia3	41.0	22000	4		53
2927	$Bi_{0.95}Sm_{0.05}NbO_4$	1040	Orthorhombic Pnma	41.0	5200		−200	1258

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
2928	$Bi_{12}TiO_{20}$	800/5h	Cubic I23 sillenite	41.0	10400		−11	1176, 1259
2929	$0.65CaTiO_3$-$0.35SmAlO_3$	1450/12h	Perovskite Orthorhombic	41.0	42000		−18	1174
2930	$0.9BiNbO_4$-$0.12ZnNb_2O_6$+1.2 wt% CuV_2O_6	850	Composite	41.0	28120		4	1217
2931	$BaTi_5O_{11}$ (hot pressed)	1050/48	Monoclinic $P2_1/n$	41.0	46000	10	40	1260
2932	$0.65CaTiO_3$-$0.35LaAlO_3$	1450/12h	Perovskite Orthorhombic	41.0	33000		−17	1174
2933	$Sr_5Ta_4O_{15}(A_nB_{n-1}O_{3n})$	1610	Hexagonal perovskite P-3m1	41.0	2400	5.99	–	325
2934	$Ca_3Nb_2O_8$		Cubic	41.0	8700	8.6	123	864
2935	$Ba_3Ti_5Nb_6O_{28}$	1300	Monoclinic $P2_1/c$	41.0	4500	5.4	8	1208
2936	$Zr_{0.513}Hf_{0.487}TiO_4$	1600	Orthorhombic Pbcn	41.0	20400		13	1057
2937	$5CaO$-$2Ta_2O_5$	1550	Mixed phases	41.0	5900	5.9	140	325
2938	$NaCa_4Ta_5O_{17}$	1350	Monoclinic (P21/b)	41.0	11600		−14	1261
2939	$CaLa_4Ti_4O_{15}$ $(A_nB_{n-1}O_{3n})$	1550/24h	Hexagonal perovskite P-3c1	41.1	50240		−25	1262
2940	$CaTi_{0.4}(Al_{1/2}Nb_{1/2})_{.6}O_3$+1 wt% Li_3NbO_4	1300/5h	Perovskite Orthorhombic	41.1	36200	7	−36	1152
2941	$Ba(Zn_{1/3}Nb_{2/3})O_3$	1390	Perovskite Cubic Pm3m	41.1	86900	9.5	31	787, 1238
2942	$BaTi_5O_{11}$ (reaction sintering)	1100	Monoclinic $P2_1/n$	41.2	47400		36	1263
2943	$0.4La(Mg_{0.4}Sr_{0.1}Sn_{0.5})O_3$-$0.6Ca_{0.8}Sr_{0.2}TiO_3$	1550/4h	Composite	41.2	56900		−6	1264
2944	$CaTi_{0.4}(Al_{1/2}Nb_{1/2})_{.6}O_3$	1500/5h	Perovskite Orthorhombic	41.3	27100	7	−44	1152
2945	$EuTiTaO_6$	1525	Aeschynite Orthorhombic	41.3	59500		19	583
2946	Li_2O-Nb_2O_5-TiO_2 (5:1:5)+1 wt% B_2O_3	900		41.3	9320			1140
2947	ZnO-Nb_2O_5-$0.08SnO_2$-$1.92TiO_2$+1 mol% MnO_2+4 wt% $BaCuB_2O_5$	850	composite	41.3	1690		−16	1265
2948	$CaTi_{0.5}(Al_{1/2}Ta_{1/2})_{0.5}O_3$	1500/15h	Perovskite Orthorhombic	41.4	26100	8	−20	1266
2949	$Zn_{0.7}Ni_{0.3}TiNb_2O_8$	1125/4h	Orthorhomic Pbcn	41.4	31800		−9	1267
2950	$Ba_{0.9}Ca_{0.1}(Y_{.285}Nb_{1/2})O_{3+\delta}$		Perovskite	41.5	48860	7.85	258	1202
2951	$BiNbO_4$:0.4 wt% B_2O_3	960/2h	Orthorhombic Pnma	41.5	21000		−2	1268
2952	$0.7CaTiO_3$-$0.3(La_{0.5}Nd_{0.5})AlO_3$		Rhombic perovskite	41.5	37000	8	4	1269
2953	$Ca_2Zn_4Ti_{15}O_{36}$+8 wt% B_2O_3	990	Hexagonal	41.5	11400		95	1270

2954	$Ca[Ti_{1-x}(Mg_{1/3}Nb_{2/3})_x]O_3$ (x=0.7)	14504h		41.6	29450		−12	1271
2955	$Sm(Nb_{0.75}Ta_{0.25})TiO_6$			41.6	18900		36	671
2956	$CaLa_4Ti_3O_{15}$	1450	$A_nB_{n-1}O_{3n}$ Hexagonal Perovskite P-3m	41.6	8100	4.31	−25	1272
2957	$5Li_2O$-Nb_2O_5-$5TiO_2$+1 wt% V_2O_5	900/6h	M phase+Li_2TiO_3	41.7	7800		45	1273
2958	$(LiBi)_{1/2}MoO_4$	560	Scheelite	41.7	3200	5.5	240	677
2959	$0.8Ba_{0.6}Sr_{0.4}La_4Ti_4O_{15}$-$0.2Ba_5Nb_4O_{15}$	1475	Hexagonal Perovskite	41.7	25100		2	1274
2960	$Zr(Zn_{1/3}Nb_{2/3})_{0.6}Ti_{1.4}O_6$		$ZrTi_2O_6$ type Orthorhombic Pbcn	41.7	42100		−16	1275
2961	$SmTiTaO_6$	1500	Aeschneite Orthorhombic	41.8	24500		24	583
2962	$(Ni_{1/3}Ta_{2/3})_{1-x}Ti_xO_2$ (x=0.3)	1300	Rutile Tetragonal $P4_2/mmm$	41.8	20600		35	1276
2963	$BiNb_{1-x}Mo_xO_4$ (x=0.01)	950	Orthorhombic Pnma	41.8	3500		−15	1277
2964	$Pr_{0.2}Gd_{0.8}TiNbO_6$	1400	Orthorhombic Pnma	41.9	9500		35	564
2965	$Ba(Nd_{1/2}Nb_{1/2})O_3$	1500/96h	Perovskite	41.9	15000	6.8	13	590
2966	$Ba_{3-x}Sr_xLaNb_3O_{12}$ (x=0.5)	1390	Trigonal R-3m	41.9	19400		−65	1125
2967	$0.67CaTiO_3$-$0.33NdAlO_3$	1450/10h	Perovskite Orthohombic	42.0	42900		45	1174
2968	$ZrTiO_4$	1400	Orthorhombic Pbcn	42.0	31000	7	58	1188
2969	$Ca_{4.38}Ni_{0.62}Nb_2TiO_{12}$	1550	Perovskite Orthorhombic Pnma	42.0	28200	4	≈0	230
2970	$Sr_4Ti_3O_{10}$	1300/5h	Tetragonal I4/mmm	42.0	960	4		53
2971	$0.95Ba(Zn_{1/3}Nb_{2/3})O_3$-$0.05BaZrO_3$	1450/2h	Perovskite Perovskite Cubic Pm3m	42.0	96000	7	27	1278
2972	$0.84Ba_5Nb_4O_{15}$-$0.16BaNb_2O_6$+0.3 wt% B_2O_3	900	Composite	42.0	28000		0	835
2973	$Ba_xLa_4Ti_{3+x}O_{12+3x}$ (x=0.2)	–		42.0	86000		−17	1279
2974	$BaTi_5O_{11}$	1120/24	Monoclinic $P2_1/n$	42.0	61100	–	40	1280
2975	$La_{0.43}Ca_{0.57}[Ca_{0.08}Mg_{0.14}Ti_{0.78}]O_3$		Perovskite	42.0	18000	5.0	9	950
2976	$La_9Mg_{0.5}Ti_{8.5}O_{31}$		Perovskite slab series	42.0	15000	8.4	−11	950
2977	$0.6CaTiO_3$-$0.4SmGaO_3$	1450/12h	Perovskite, multiphase	42.0	35000		−11	1174
2978	$(1-x)LaMg_{1/2}Ti_{1/2}O_3$-$xLa_{2/3}TiO_3$ (x=0.45)		Perovskite	42.0	4500	4.8	−30	950
2979	$BaNb_2O_6$ (hex)	1050	Hexagonal columbite	42.0	4000		−800	835, 995
2980	$Ba_{0.79}Sr_{0.21}Ti_5O_{11}$(hot pressed)	1050/72h	Monoclinic $P2_1/n$	42.0	39000	10	44	1260

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
2981	$Ca_{4.38}Ni_{0.62}Nb_2TiO_{12}$	1550	Perovskite	42.0	28200	4	0	230, 1112
2982	$Sr(Sm_{0.5}Ta_{0.5})O_3$+0.5 wt% Nb_2O_5+3 wt% TiO_2	1600/4h	Complex perovskite Tetragonal	42.0	8750		3	859
2983	$Ca_3Sr_2Ta_2TiO_{12}$	1600	Perovskite Orthorhombic Pnma	42.0	16000	3.5	14	1209
2984	$0.6CaTiO_3$-$0.4Sm(Mg_{0.5}Ti_{0.5})O_3$	1550	composite	42.0	9200	4.8	6	865
2985	$Ba_{0.8}Sr_{0.2}(Zn_{1/3}Ta_{2/3})_{0.94}Ti_{0.06}O_3$	1400	Perovskite	42.0	82000	10	−13	1192
2986	$Ca_{0.6}(Li_{.5}Nd_{.5})_{0.4})_{0.45}Zn_{.55}TiO_3$+2 wt% $0.33ZnO$-$0.67H_3BO_3$	900/4h	Multi phase	42.0	10300		19	1281
2987	$0.1CaTiO_3$-$0.9Nd(Mg_{1/2}Ti_{1/2})O_3$	1400	Perovskite Orthorhombic	42.0	35000		−10	1282
2988	$Sr(Sm_{1/2}Ta_{1/2})O_3$+3 wt% TiO_2	1600	Perovskite	42.0	8800		3	861
2989	$0.76ZrTi_2O_6$-$0.24ZnNb_2O_6$	1300/4h	Composite	42.0	22976			1283
2990	$Nd(W_{0.5}Ti_{1.5})O_6$	1350	Orthorhombic Pnma Aeschynite type	42.0	26200		9	1121
2991	$0.4La(Mg_{1/2}Ti_{1/2})O_3$-$0.6(Na_{0.5}Nd_{0.5})TiO_3$+1 wt% B_2O_3	1475	Composite	42.0	33000	8	1	1284
2992	$5.5Li_2O$-Nb_2O_5-$7.5TiO_2$	1075		42.0	16900	5.75	64	1253
2993	$Ca^{(}Zr_xTi_{1-x})O_3$ (x=0.9)	1515/15h	Perovskite Orthorhombic Pcmn	42.0	10700	4.6	82	916
2994	$0.36Ca_4La_2Ti_5O_{17}$-$0.64LaAlO_3$	1560/4h	Composite	42.0	12500		0	1285
2995	$0.4LaAlO_3$-$0.6SrTiO_3$	1680	Perovskite	42.1	83000	9.5	8	832
2996	$Ba_5Nb_{4-x}(W_{1/2}Ti_{1/2})O_{15}$ (x=0.4)		Perovskite	42.2	38600		53	1286
2997	$Ba_4LaTiTaO_{15}$	1540/6h	Trigonal P-3m1	42.3	28790		33	1287
2998	$Ca(La_{0.5}Nd_{0.5})_4Ti_4O_{15}$ ($A_nB_{n-1}O_{3n}$)	1525	Hexagonal Perovskite	42.3	15200	8.3	−6	1288
2999	$Ba_{11}TiNb_8O_{33}$	1400		42.3	27000		47	1289, 1290
3000	$CaLa_{0.5}Nd_{0.5}Ti_4O_{15}$	1525	Hexagonal Perovskite	42.3	15200	8.3	−6	1288
3001	$Ba_4LaTiTa_3O_{15}$	1540/6h	Perovskite Hexagonal	42.3	28800		33	1291
3002	$Sr_{0.92}[Li_{1/4}Nb_{3/4}]_{0.92}Ti_{0.08}O_3$	1350/2h	Perovskite	42.3	31500	9	–	1197
3003	ZnO-Nb_2O_5-TiO_2-SnO_2+1.5 wt% CuO-V_2O_5	860	Mixture phases	42.3	9000		8	1292

3004	$Ba_{1-x}La_x[Zn_{(1+x)/3}Nb_{(2-x)/3}]O_3$ (x=0.05)	1350/4h	Perovskite	42.4	46530		35	1226
3005	$BaLa_3Ti_2NbO_{12}$	1460/6h	Hexagonal perovskite	42.4	33600		6	1293
3006	$Zr_{0.7}(Zn_{1/3}Ta_{2/3})_{0.3}TiO_4$	1300	Orthorhombic α-PbO_2	42.5	40200	5	1	1294
3007	$0.3BaTiO_3$-$0.7La(Mg_{1/2}Ti_{1/2})O_3$		Perovskite I4/mcm	42.5	14225	7.23	−34	933
3008	$5.5Li_2O$-Nb_2O_5-$7.5TiO_2$	1100		42.6	16800		66	1253
3009	$SrLaSm_3Ti_5O_{17}$	1350		42.6	7300		−96	1295
3010	$Ba_2La_2TiNb_2O_{12}$	1440		42.7	31130		−4	1296
3011	$Ba_{21}Nb_{16}TiO_{63}$			42.7	19000		25	1289
3012	$Ba_2La_3Ti_3NbO_{15}(A_5B_4O_{15})$	1460	Hexagonal perovskite	42.8	21700	5.85	−8	1297
3013	$Ba_{16}Nb_{12}TiO_{48}$		Not available	42.9	29000		25	1289
3014	$Ba_{0.9}Ca_{0.1}(Y_{0.315}Nb_{1/2})O_{3+\delta}$		Perovskite	42.9	63500	7.78	235	1202
3015	$Ba_6Ti_{1-x}Sn_xNb_4O_{18}$ (x=0)	1460	Trigonal R-3m	43.0	11530	5.6	64	982
3016	$Bi_{12}SiO_{20}$	800/5h	Cubic I23	43.0	86800		−10	1298
3017	$Sr_4LaTiNb_3O_{15}$	1460	Hexagonal perovskite	43.0	44700	5.18	13	1299
3018	$Li_{0.215}Nb_{0.645}Ti_{0.14}O_2$	1020		43.0	14500		−15	1300
3019	$Ba_{2-x}Sr_xLa_3Ti_3NbO_{15}$ (x=1)	1520		43.0	39100		1	1301
3020	$Pb_{0.5}Ca_{0.5}(Cr_{1/2}Nb_{1/2})O_3$		Perovskite	43.0	3800	4.6	293	996
3021	$BiNbO_4$	875	Orthorhombic Pnma	43.0	15700	4.3	38	1302, 1303
3022	$0.7CaTiO_3$-$0.3NdAlO_3$		Perovskite Orthorhombic	43.0	47000	–	0	1304, 1305
3023	$Sr(Zn,Nb)O_3$-$SrTiO_3$		Perovskite	43.0	25000	5	−5 to 5	1306
3024	$La_{0.57}Ca_{0.43}[Ca_{0.11}Mg_{0.18}Ti_{0.71}]O_3$		Perovskite	43.0	26000	3.5	−19	950
3025	$Ca_4BaTa_2TiO_{12}$	1575	Orthorhombic Pnma	43.0	5000	3.9	14	1307
3026	$0.16BaNb_2O_6$-$0.84Ba_5Nb_4O_{15}$+0.3 wt% B_2O_3+0.3 wt% V_2O_5	900	Composite	43.0	19500		0	835
3027	$Ca_5NbTaTiO_{12}$	1580	Complex perovskite Orthorhombic Pnma	43.0	30000	–	28	1209, 1231
3028	$Ba(Nd_{0.8}Sm_{0.2})_2Ti_4O_{12}$+1 wt% B_2O_3	1020	Tungsten Bronze	43.0	5500			1308
3029	$Ca_{4.36}Zn_{0.64}Nb_2TiO_{12}$	1550	Orthorhombic perovskite Pnma	43.0	29000	4.0	0	230
3030	$Ba_6Nb_4TiO_{18}$	1625/2h	$A_6B_5O_{18}$ type perovskite	43.0	9500		53	895
3031	$Sr_6Nb_4TiO_{18}$	1625/2h	$A_6B_5O_{18}$ type perovskite	43.0	6700		26	895

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_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 $P2_1$	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	$Ca[(Li_{1/3}Nb_{2/3})_{0.7}Ti_{0.3}]O_{3\text{-}d}$+6 wt% Bi_2O_3, 2 wt% B_2O_3	920	Perovskite	43.1	10600	7.68	10	1235
3044	$Ca[(Li_{1/3}Nb_{2/3})_{0.7}Ti_{0.3}]O_{3\text{-}d}$+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	$(1\text{-}x)Ca(Mg_{1/3}Ta_{2/3})O_3$-$x(Ca_{0.8}Sr_{0.2})TiO_3$ (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	$CaLa_4Ti_4O_{15}$ ($A_nB_{n-1}O_{3n}$)	1550	Hexagonal perovskite	43.6	33850	7.8	−17	1288
3058	$0.7CaTiO_3$-$0.3NdAlO_3$	1450/10h	Rhombic perovskite	43.7	34800		14	1174
3059	$Ba(Ti_{0.85}Mn_{0.15})O_3$+15 wt% Li_2CO_3	950	Perovskite	43.7	2500		−30	1319
3060	$(Sr_{0.2}Ca_{0.488}Nd_{0.2}0_8)Ti_{1-x}Ga_{4x/3}O_3$ (x=0.5)	1350/4h	Orthorhombic Perovskite Pnma	43.7	60000	4.7	8	1320
3061	$0.7Ca(Mg_{1/3}Nb_{2/3})O_3$-$0.3(Ca_{0.8}Sr_{0.2})TiO_3$		Perovskite	43.8	45200	7.2	−4	1321
3062	$Zn_{0.17}Nb_{0.33}Ti_{0.5}O_2$	1080	–	43.8	35000	9		1322
3063	$SrLa_4Ti_4O_{15}$ ($A_nB_{n-1}O_{3n}$)		Hexagonal perovskite P-3m	43.8	50200	4.15	−14	1262, 1272
3064	$Ba_{1-x}La_x[Zn_{(1+x)/3}Nb_{(2-x)/3}]O_3$ (x=0.35)	1350/4h	Perovskite	43.8	2180		−10	1226
3065	$Bi_{0.992}Gd_{.0.008}NbO_4$	900/3h	Orthorhombic Pnma	43.8	16850	4.3	0	1323
3066	$Ca[(Li_{1/3}Nb_{2/3})_{0.7}Ti_{0\cdot.3}]O_{3-\delta}$+1 wt% Bi_2O_{3+} 1 wt% B_2O_3	960	Perovskite	43.9	16600	7.6	35	1235
3067	$Ca_4MgNb_2TiO_{12}$-$xCaTiO_3$ (x=0.3)		Composite	43.9	20200		−7	1324
3068	$0.66Ca(Mg_{1/3}Nb_{2/3})O_3$-$0.34CaTiO_3$+ 0.25 wt% B_2O_3	1250	Composite	44.0	30000	6.7	−2	1325
3069	$0.1CaTiO_3$-$0.9Nd(Mg_{1/2}Ti_{1/2})O_3$+0.5 wt% ZnO	1325	Composite	44.0	43800		1	1326
3070	$0.32Nd(Zn_{0.45}Mg_{0.05}Ti_{0.5})O_3$-$0.1NdAlO_3$-$0.58CaTiO_3$		Composite	44.0	32200	1.97	0	1327
3071	$Bi_2Ti_3TeO_{12}$	900/10h		44.0	12500		146	1131
3072	$ZrTiO_4$-$ZnNb_2O_6$		Composite	44.0	48000		0	1283
3073	$Ca_2Sr_3Ta_2TiO_{12}$	1575	Perovskite Orthrohombic Pnma	44.0	8500	3.5	18	1209
3074	$BaTiNb_4O_{13}$	1250	Orthorhombic Pbma	44.0	9000	4.7	15	1208
3075	$Sr_2Zn_4Ti_{15}O_{36}$	1150/8h	Trigonal R-3m	44.0	3600	10	160	1026
3076	$Ba_8Ta_{4+0.8x}Ti_{3-x}O_{24}$ (x=0.8)	1400/40h		44.0	9720			920
3077	$Ba(Nd_{1/2}Nb_{1/2})O_3$	1600	Complex perovskite	44.0	11700		10	1136
3078	$Ca_{0.7}Nd_{0.3}T_{0.7}Al_{0\cdot.3}O_3$		Perovskite Orthorhombic	44.0	40000		0	1328
3079	$Ba(La_{0.99}Al_{0.11})_4Ti_4O_{15}(A_nB_{n-1}O_{3n})$		Hexagonal perovskite	44.0	47000		1	1329
3080	$066CaTiO_3$-$0.34LaAlO_3$	1450/12h	Perovskite Orthorhombic	44.0	30000		−3	1174
3081	$Ba_{0.9}Ca_{0.1}(Y_{0.33}Nb_{1/2})O_{3+\delta}$		Complex perovskite	44.0	41210	7.7	234	1202
3082	$0.7Ca(Li_{1/4}Nb_{3/4})O_3$-$0.3CaTiO_3$	1250	Composite	44.0	12000		−9	1330

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
3083	$Sr_2La_4Ti_5O_{18}$+0.3 wt% Bi_2O_3-B_2O_3	1625/2h		44.0	23000		22	895
3084	0.6$CaTiO_3$-0.4$NdGaO_3$	1450/12h	Perovskite	44.0	30000		−18	1174
3085	$BiNbO_4$+0.5 wt% V_2O_5	895	Orthorhombic Pnma	44.0	15800	7	18	1311
3086	$BiNbO_4$+0.25 wt% CuO+V_2O_5	900	Orthorhombic Pnma	44.0	18660		−8	1311
3087	$Bi_{0.95}Sm_{0.05}NbO_4$+0.5 wt% CuO	900	Orthorhombic Pnma	44.0	12900		−4	1331
3088	$BiNb_{0.4}Ta_{0.6}O_4$	940	Orthorhombic Pnma	44.0	21000		−30	1332
3089	0.5$La(Mg_{1/2}Ti_{1/2})O_3$-0.5$CaTiO_3$+1 wt% B_2O_3	1400	Perovskite	44.0	28000	7	−8	1312
3090	0.225Li_2O-0.67Nb_2O_5-0.1TiO_2	1350		44.0	28000		−20	760
3091	$Na_{1-x}K_xCa_4Nb_5O_{17}$ (x=0)	1200	Monoclinic P21/a $A_nB_nO_{3n+2}$	44.0	13800		−120	1333
3092	$Ba_8Nb_4Ti_3O_{24}$	1450	Hexagonal $P6_3/mmc$	44.1	22000		115	1334
3093	0.66$CaTiO_3$-0.34$(La_{0.5}Nd_{0.5})GaO_3$		Rhombic perovskite	44.1	43000	8	1	1269
3094	$Ba_2La_2TiNb_2O_{12}$	1350/6h	Hexagonal perovskite	44.2	31660	6.9	−5	1316
3095	$Ca[Ti_{1-x}(Mg_{1/3}Nb_{2/3})_x]O_3$ (x=0.65)	14504h	Perovskite	44.2	28340		−2	1335
3096	$CaLa_4Ti_4O_{15}$+1 wt% $BiVO_4$	1425		44.3	51400		−9	1336
3097	$BaLa_4Ti_4O_{15}(A_nB_{n-1}O_{3n})$	1600/2h	Hexagonal perovskite P-3c1	44.4	41000		−26	1262, 1329 ,1337
3098	$Bi_{0.95}Sm_{0.05}NbO_4$	950	Orthorhombic Pnma	44.4	13000	7.2	−4	1338
3099	$(Li_{0.5}Bi_{0.5})MoO_4$	560	Scheelite	44.4	3200	5.5	245	30
3100	$Ca_4La_2Ti_{5-x}(Mg_{1/3}Nb_{2/3})_xO_{17}$ (x=2.5)	1540	Orthorhombic Pbnm	44.4	16400		15	1118
3101	0.67$ZrTi_2O_6$-0.33$ZnNb_2O_6$+0.7 wt% $MnCO_3$	1270	Composite	44.4	44800		−7	1339
3102	0.5$Nd(Co_{1/2}Ti_{1/2})O_3$-0.5$(Ca_{0.8}Sr_{0.2})TiO_3$	1340/4h	Composite	44.5	20000		0	1340
3103	$BiNb_{0.95}Sb_{.05}O_4$	880	Orthorhombic Pnma	44.5	14300		−5	1251
3104	$BiNb_{0.88}Ta_{0.12}O_4$+0.5 wt% CuO	920	Orthorhombic Pnma	44.5	14000		−0	1313
3105	$Ba(Pr_{1/2}Nb_{1/2})O_3$	1600	Complex perovskite	44.5	28500		−22	1136
3106	$Ba(Y_{0.3}Bi_{0.2}Nb_{.5})O_3$	1300	Complex perovskite	44.6	2000		6	1341
3107	$Ba_4Nd_2Ti_3Nb_2O_{18}$	1450/8h		44.6	13100		18	1342
3108	$Ba_{1-x}La_x[Zn_{(1+x)/3}Nb_{(2-x)/3}]O_3$ (x=0.3)	1350/4h	Perovskite	44.7	1990		7.7	1226

3109	$Ca_2La_4Ti_5O_{18}$		$A_nB_{n-1}O_{3n}$ Trigonal perovskite R-3m	44.7	20100	4.19	6	1272
3110	$Ca_2Zn_4Ti_{15}O_{36}$+4 wt% CaO-B_2O_3-SiO_2	1050/2h	Trigonal R-3	44.7	31000			1343
3111	0.67$CaTiO_3$-0.33$(La_{0.5}Nd_{0.5})GaO_3$		Rhombic perovskite	44.7	41000	8	6.3	1269
3112	$Ca[(Li_{1/3}Nb_{2/3})_{1-x}Ti_x]O_3$ (x=0.3)	1150/3h	Perovskite	44.7	22500		20	752
3113	$Ba_6Nb_4TiO_{18}$	1450	Trigonal R-3m	44.9	12000		33	895
3114	$Sr(Fe_{1/2}Nb_{1/2})O_3$+0.2 wt% B_2O_3	1350/4h	Complex perovskite Cubic Pm3m	44.9	10600		−15	823
3115	$Sr(Fe_{1/2}Nb_{1/2})O_3$	1600/4h	Complex perovskite Cubic Pm3m	44.9	4800		−24	823
3116	0.7$La_{2/3}TiO_3$-0.3$LaAlO_3$	1400/33h	Perovskite Orthorhombic	44.9	33000	6	7	1096
3117	$Ca_5Nb_4TiO_{17}$	1475	Monoclinic $P2_1/c$	44.9	17600		−113	877, 1245
3118	$BiNbO_4$+0.03 wt% $CuV_2O_{6\ (Ortho)}$	1000	Orthorhombic Pnma	44.9	16100		−3	1104
3119	0.55$Ca(Mg_{1/3}Ta_{2/3})O_3$-0.45$Ca_{0.8}Sm_{0.4/3}TiO_3$	1450	Composite	45.0	41700	6.6	0	1344
3120	$Ba_{2/3}La_{1/3}Zn_{1/3}Ti_{1/3}Nb_{1/3}O_3$	1400		45.0	6500	6.09	−6	919
3121	$NiNb_2O_6$+30 wt% TiO_2	1300/2h	Orthorhombic Pbcn	45.0	7700	6	73	1345
3122	0.73$CaTiO_3$-0.27$NdAlO_3$	1450/10h	Rhombic perovskite	45.0	31000		−15	1174
3123	$Ca[(Li_{1/3}Ta_{2/3})_{.5}Ti_{0.5}]O_{3-\delta}$+3 wt% B_2O_3	1050	Perovskite	45.0	12300	8	75	765
3124	$Na_{1-x}K_xCa_4Nb_5O_{17}$ (x=0.25)	1300	Monoclinic$P2_1/a$ $A_nB_nO_{3n+2}$	45.0	4600		34	1333
3125	0.81$BiVO_4$-0.19YVO_4	87072h	Monoclinic+Tetragonal	45.0	14000		10	1346
3126	$Na_{1-x}K_xCa_4Nb_5O_{17}$ (x=0.75)	1300	Monoclinic$P2_1/a$ $A_nB_nO_{3n+2}$	45.0	3700		123	1333
3127	0.58$ZnNb_2O_6$-0.42TiO_2	1250/2h	Composite	45.0	6000		0	1092
3128	0.42$ZnNb_2O_6$-0.58TiO_2	1250	Composite	45.0	48000	8	0	1092
3129	0.45$Nd_3Ga_5O_{12}$ -0.65$CaTiO_3$	1450	Composite	45.0	46000	5	−2	340
3130	0.7$CaTiO_3$-0.3$SmAlO_3$	1450/12h	Perovskite Orthorhombic Pbnm	45.0	42000		1	1174
3131	0.7$CaTiO_3$-0.3$NdAlO_3$	1450/10h	Perovskite Orthorhombic Pbnm	45.0	44000		3	1174
3132	$Ba(La_{1/2}Nb_{1/2})O_3$	1600	Complex perovskite Monoclinic	45.0	5700		7	1136
3133	$BaLa_4Ti_4O_{15}(A_nB_{n-1}O_{3n})$		Trigonal perovskite P-3m1	45.0	48000			1329
3134	$Sr(Fe_{1/2}Nb_{1/2})O_3$	1450/4h	Perovskite Cubic Pm3m	45.0	4800		−24	1163
3135	$CaSr_4Ta_2TiO_{12}$	1550	Perovskite Orthorhombic Pnma	45.0	15500	3.4220	21	1209

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
3136	$Ba_xLa_4Ti_{3+x}O_{12+3x}$ (x=0.4)	–	Trgonal perovskite P-3m1	45.0	60000		−15	1279
3137	$Ba_xLa_4Ti_{3+x}O_{12+3x}$ (x=0.6)	–	Trigonal perovskite P-3m1	45.0	50000		−13	1279
3138	$BaTiTa_2Nb_2O_{13}$	1350	Orthorhombic Pbma	45.0	3500	5.2	96	1208
3139	$BaSr_4Nb_4O_{15}(A_nB_{n-1}O_{3n})$	1400	Trigonal Perovskite P-3m1	45.0	23300	4.57	82	325
3140	$0.2CaTiO_3$-$0.8Sr(Mg_{1/3}Nb_{2/3})O_3$	1600	Perovskite	45.0	9000		0	1347
3141	$Ba_2La_3Ti_3TaO_{15}$	1520		45.0	26800		1	1348
3142	$0.6CaTiO_3$-$0.4LaGaO_3$	1450/12h	Perovskite	45.0	34000		−20	1174
3143	$0.65CaTiO_3$-$0.35SmGaO_3$	1450/12h	Perovskite	45.0	34000		1	1174
3144	$SmTiNbO_6$	1400	Euxenite Orthorhombic Pnma	45.0	18000	4.89	50	563
3145	$0.7CaTiO_3$-$03NdAlO_3$	1450/10h	Perovskite Orthorhombic	45.0	44000		0	1349
3146	$0.65CaTiO_3$-$0.35NdGaO_3$	1450	Perovskite Orthorhombic	45.0	46000		−2	1349
3147	$Ca[(Li_{1/3}Nb_{2/3})_{1-x}Ti_x]\ O_{3-\delta}$ (x=0.3)	1150/3h	Perovskite	45.0	22500		20	752
3148	$La_{2/3}TiO_3$ - $LaAlO_3$			45.0	33000		7	1096
3149	$0.48La(Co_{1/2}Ti_{1/2}O_3$-$0.52CaTiO_3$	1550	$P2_1/n$ Monoclinic perovskite	45.0	5000	7.8	0	1309
3150	$0.5Nd(Zn_{1.2}Ti_{1/2})O_3$-$0.5CaTiO_3$	1300/4h	$P2_1/n$ Monoclinic perovskite	45.0	56000		0	1350
3151	$Ba(Mn_{1/2}Ti_{1/2})O_3$	1450/2h	Perovskite Hexagonal	45.0	11600	5.75	−4	1351
3152	$Ba_3La_2Ti_2Ta_2O_{15}$	1540	Trigonal P-3m1	45.1	31000		−13	1353
3153	$0.71CaTiO_3$-$0.29NdAlO_3$	1450/10h	Perovskite Orthorhombic	45.1	38450		6	1174
3154	$(1\text{-}x)Ca(Mg_{1/3}Ta_{2/3})O_3$-$xCaTiO_3$ (x=0.45)	1550	Perovskite Orthorhmbic Pbnm	45.1	34800		17	1354
3155	$0.7CaTiO_3$-$0.3LaGa_{0.5}Al_{0.5})O_3$		Rhombic perovskite	45.2	40000	8	13	1306
3156	$0.7CaTiO_3$-$0.3\ (La_{.5}Nd_{.5})(Ga_{0.5}Al_{0.5})O_3$		Rhombic perovskite	45.2	43000	8	9	1269
3157	$0.7CaTiO_3$-$0.3Nd(Ga_{0.5}Al_{0.5})O_3$		Rhombic perovskite	45.3	38000	8	11	1269
3158	$Ba_8Nb_4Ti_3O_{24}$	1400	Hexagonal $P6_3/mmc$	45.3	23500	5.6	115	1334
3159	$Ba_4LaNbTa_2O_{15}$		Hexagonal perovskite	45.3	25100		52	1355
3160	$Ba_{1-x}Sr_x\ La_4Ti_4O_{15}$ (x=0.6)	1550	Trigonal P-3m1	45.4	47500		−1	1356
3161	$0.6La(Mg_{1/2}Ti_{1/2})O_3$-$0.4Ca_{0.6}La_{0.8/3}$ TiO_3+w wt% CuO	1450	Composite	45.5	44600	8	2	1357
3162	$Ba_{0.2}Ca_{0.8}(Fe_{1/2}Nb_{1/2})O_3$		Perovskite Orthorhombic Pbnm	45.5	2300	7.4	−34	1163
3163	$(Ba_{1-x}Sr_x)La_4Ti_4O_{15}$ (x=0.4)	1450/4h	Trigonal P-3m1	45.7	44200		−6	1356
3164	$PrTiTaO_6$	1500	Aeschneite Orthorhombic	45.8	32300		33	583
3165	$Pr_{0.5}Gd_{0.5}TiNbO_6$	1400		45.9	9500		41	564

3166	$Zr_{0.992}Hf_{0.008}TiO_4$		Orthorhombic Pbcn	45.9	13000	8.5	53	1088
3167	$Pb_{0.25}Ca_{0.75}(Mg_{1/3}Nb_{2/3})O_3$		Perovskite	46.0	8700	3.7	−34	996
3168	$BaLa_4Ti_4O_{15}$		Hexagonal perovskite P-3m1	46.0	47000		−11	1329, 1337
3169	$Ca_3Ti_2O_7$		Orthorhombic $Ccm2_1$	46.0	2600	2.69	50	1358
3170	$0.1La_2Ti_2O_7$-$0.9La_4Ti_9O_{24}$	1300	Composite	46.0	5500		0	1137, 1138
3171	$BaTiTa_4O_{13}$	1450		46.0	6000	4.6	145	1208
3172	$La_{0.39}Ca_{0.61}[Ca_{0.11}Mg_{0.08}Ti_{0.81}]O_3$		Perovskite	46.0	17000	4.7	36	950
3173	$Ba_2La_4Ti_5O_{18}$	1575/10h	$A_nB_{n-1}O_{3n}$ perovskite Trigonal R-3m	46.0	31850		−36	1234
3174	$Ca_5Nb_{1.5}Ta_{0.5}TiO_{12}$	1560	Complex perovskite Orthorhombic Pnma	46.0	28400		35	1231
3175	$CeTiTaO_6$	1540	Aeschneite orthorhombic	46.0	33300		41	583
3176	$0.3SrTiO_3$-$0.7Ca(Mg_{1/3}Nb_{2/3})O_3$	1475/3h	Perovskite	46.0	29300	6.8	2	1359
3177	$Ca_{0.7}Ti_{0.7}La_{0.3}O_3$+0.25 wt% Al_2O_3	1500	Perovskite Orthorhombic	46.0	38200	4	12	1360
3178	$7Bi_2O_3$-$2TeO_2$ (oxygen atm)	750/15h	–	46.0	1100		−144	1068
3179	$Ca_2Zn_4Ti_{15}O_{36}$+5 wt% V_2O_5	930	Trigonal R-3	46.0	13400		164	1361
3180	$La_3Ti_2TaO_{11}$	1560		46.0	7500		−47	1362
3181	$CaLa_4(Zr_{0.05}Ti_{0.95})_4O_{15}$	1550	Hexagonal	46.0	47500		−10	1363
3182	$Bi_{0.95}Ce_{0.05})NbO_{4.025}$	950	Triclinic+Orthorhombic	46.1	15000			1364
3183	$(Ba_{1-x}Sr_x)La_4Ti_4O_{15}$ (x=0.8)	1600	$A_nB_{n-1}O_{3n}$ Trigonal P-3m1	46.1	52800		−3	1356
3184	$Ba(Er_{03}Bi_{0.2}Nb_{0.5})O_3$	1300	Perovskite	46.1	1500		−27	1341
3185	$0.65LiNb_3O_8$-$0.35TiO_2$	11002h	Composite	46.2	5800		0	788
3186	$Sr_6Nb_4TiO_{18}$	1625/2h	Not available	46.2	6700		26	895
3187	$0.4ZnNb_2O_6$-$0.6TiO_2$	1125	Columbite+rutile	46.2	48000		−1	1365
3188	$0.5ZnTa_2O_6$-$0.5TiO_2$		Composite	46.2	36700		74	1366
3189	$0.55La(Mg_{1/2}Ti_{1/2})O_3$-$0.45SrTiO_3$	1475/4h	Composite	46.3	34000	8	0	1367
3190	$Ba_{2-x}Sr_xLa_3Ti_3NbO_{15}$ (x=0.5)	1500	$A_nB_{n-1}O_{3n}$ Trigonal P-3m1	46.3	33600		4	1301, 1297
3191	$BaLa_4Ti_4O_{15}$	1450	$A_nB_{n-1}O_{3n}$ Trigonal perovskite P-3m1	46.3	16200	5.15	−13	1272

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
3192	$Ba_{0.2}Sr_{0.8}La_4Ti_{4.2}O_{15}$	1450/5h	Perovskite Trigonal	46.4	36100		−3	1368
3193	$0.64CaTiO_3$-$0.36LaGaO_3$		Rhombic perovskite	46.5	48000	8	−3	1269
3194	$Bi_{0.95}Ce_{0.05}NbO_4$+0.4 mol% CuO	950	Orthorhombic Pnma	46.5	3000			1369
3195	$Ba_3La_2Ti_2Nb_{2-x}Ta_xO_{15}$ (x=1)	1500	Trigonal P-3m1	46.5	27140	–	−4	1353
3196	$CaTi_{0.54}(Al_{1/2}Ta_{1/2})_{0.46}O_3$	1500/15h	Perovskite Orthorhombic	46.5	27300	8	0	1266
3197	$Ca_5Nb_2TiO_{12}$+1 wt% NiO	1550/4h	Complex perovskite Orthorhombic Pnma	46.5	29000		34	1155
3198	$Ca_5Nb_2TiO_{12}$+1 wt% Co_3O_4	1550/4h	Complex perovskite Orthorhombic Pnma	46.5	29000		32	1155
3199	(1-x)$La(Mg_{1/2}Ti_{1/2})O_3$-x$La_{2/3}TiO_3$ (x=0.49)		Perovskite I2/a	46.5	8300	6.2		889
3200	$Sr(Ga_{0.5}Nb_{0.5})_{1-x}Ti_xO_3$ (x=0.3)	1575	Cubic perovskite Fm3m	46.6	42200		5	1370
3201	$Ba_3Nd_2Ti_2Nb_2O_{15}$	1450/3h	Hexagonal perovskite	46.8	19500	5.1	28	1352
3202	(1-y)$Li_{2.02}Ti_{0.92}Nb_{0.06}O_3$ (y=0.6)	1070		46.8	8040		35	722
3203	$(Ba_{1-x}Sr_x)La_4Ti_4O_{15}$ (x=0.2)	1450	Trigonal perovskite P-3m1	46.8	24500		−8	1356
3204	$Ba_{2-x}Sr_xLa_3Ti_3NbO_{15}$ (x=0.75)	1510	Trigonal perovskite P-3m1	46.8	36500		2	1301
3205	$Ba_{1-x}Ca_x(Sc_{1/2}Nb_{1/2})O_3$ (x=0.5)	1650	Perovskite	46.9	28000			1371
3206	$La_2Ti_2O_7$		Monoclinic P21	47.0	8500	7.8	−10	1137
3207	$0.75CaTiO_3$-$0.25LaAlO_3$	1450/12h	Composite	47.0	36000		13	1174
3208	$Bi_2Ti_4O_{11}$		Monoclinic C2/m	47.0	4800		−540	1372
3209	$Ca_2Zn_4Ti_{15}O_{36}$	1150/8h	Hexagonal+residual rutile	47.0	41200	10	120	1026
3210	$Na_{1-x}K_xCa_4Nb_5O_{17}$ (x=0.5)	1300	Monoclinic P21/a $A_nB_nO_{3n+2}$	47.0	5000		−23	1333
3211	$BaTi_{0.3}Ga_{0.35}Nb_{0.35}O_3$	1500/4h	Perovskite-Mixture	47.0	2470	5.5		1373
3212	$0.65CaTiO_3$-$0.35LaGaO_3$	1600	Perovskite Orthorombic Pnma	47.0	40000		0	912
3213	$Ba_{2-x}Sr_xLa_3Ti_3NbO_{15}$ (x=0.25)	1490	Hexagonal P-3m1	47.0	29400		6	1301
3214	$Ba_2La_3Ti_3NbO_{15}$	1470/6h	Hexagonal perovskite P-3m1	47.0	2000		20	1374
3215	$Ba_{2-x}Sr_xLa_3Ti_3NbO_{15}$ (x=0.75)	1510	Trigonal perovskite P-3m1	47.0	36500		2	1297
3216	$Ba_{2-x}Sr_xLa_3Ti_3NbO_{15}$ (x=0.25)	1490	Trigonal perovskite P-3m1	47.0	29400		8	1297
3217	$0.222Li_2O$-$0.668Nb_2O_5$-$0.11TiO_2$	1350		47.0	25000		0	760
3218	$Ca_5Nb_2TiO_{12}$+1 wt% ZnO	1550/4h	Complex perovskite Orthorhombic Pnma	47.0	28000		34	1155

3219	$Ba_3Ti_2(Mg_{1/3}Nb_{2/3})_2Nb_4O_{21}$+5 wt% 2ZnO-$V_2O_5$	900	Hexagonal	47.0	10500		16	1375
3220	0.6$Ca(Mg_{1/3}Nb_{2/3})O_3$-0.4$Ca_{0.61}Nd_{0.26}TiO_3$	1375		47.0	37000		5	1376
3221	$Pr_{0.6}Gd_{0.4}TiNbO_6$	1400	Not available	47.1	9500		44	564
3222	0.76$ZrTi_2O_6$-0.24$ZnNb_2O_6$	1260/4h oxygen	Mixed phases	47.1	34200		0	1283
3223	0.5$La(Mg_{0.5}Ti_{0.5})O_3$-0.5$Ca_{0.0.8}Sr_{0.2}TiO_3$	1475	Composite	47.1	35000		−5	1377
3224	$SrCa_4Nb_4TiO_{17}$	1475	Not available	47.2	12000		−137	1378
3225	$TiFeNbO_6$	1125/5h	Tetragonal	47.2	2300	3.68	281	1379
3226	$Ca[Ti_{1-x}(Mg_{1/3}Nb_{2/3})_x]O_3$ (x=0.6)	14504h	Perovskite	47.3	25630		8	1271
3227	$Ba_3La_3Ti_4NbO_{18}$	1480/6h	Trigonal perovskite P-3m1	47.4	17330	5.18	35	1380
3228	(1-x)$(Ba_{0.6}Sr_{0.4}La_4Ti_4O_{13}$-x TiO_2 (x=0.05)	1550	Hexagonal Perovskite	47.4	46800		−3	1381
3229	Bi_8TiO_{14}			47.4	5400		−16	1382
3230	0.66$CaTiO_3$-0.34$LaGaO_3$		Rhombic perovskite	47.5	46000		4	1269
3231	$Ca_5Nb_2TiO_{12}$+0.5 wt% MgO	1550/4h	Complex perovskite Orthorhombic Pnma	47.5	33000		34	1155
3232	$Ca_5Nb_2TiO_{12}$+0.5 wt% CuO	1550/4h	Complex perovskite Orthorhombic Pnma	47.5	30000		37	1155
3233	11Li_2O-3Nb_2O_5-12TiO_2+LBS glass	900	Mixture	47.5	9600		50	2
3234	0.5$MgTiO_3$-0.5$CaTiO_3$-0.25(Nd_2O_3-TiO_2)		Composite	47.6	30000		8	1383
3235	$TiTe_3O_8$+1 wt% SiO_2	750	Cubic Ia3	47.6	48800		152	1384
3236	$(Ba_{1-x}Ca_x)La_4Ti_4O_{15}$ (x=0.2)	1575/4h	Trional P-3m1 Perovskite	47.7	47100		−8	1356
3237	$(Ba_{1-x}Ca_x)La_4Ti_4O_{15}$ (x=0.4)	1575/4h	Trigonal P-3m1 Perovskite	47.7	47400		−7	1356
3238	0.45$La(Mg_{0.5}Ti_{0.5})O_3$-0.55$Ca_{0.8}Sm_{0.4/3}TiO_3$		Perovskite	47.8	26500	6.2	−2	1385
3239	$Ba_5SrNb_4TiO_{18}$	1450/2h	$A_6B_5O_{18}$ type perovskite	47.9	7000		83	895
3240	$Ba(Gd_{0.3}Bi_{0.2}Nb_{0.5})O_3$	1300	Perovskite	47.9	2100		−3	1341
3241	$Ba_xLa_4Ti_{3+x}O_{12+3x}$ (x=2.5)			47.9	19480			1310
3242	$Ba_3La_2Ti_2Nb_{2-x}Ta_xO_{15}$ (x=0.5)	1480		47.9	25300	–	2	1353
3243	$Bi_{0.75}Ce_{0.25}VO_4$	900	Monoclinic	47.9	18000	7.6	15	1386

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
3244	$Pb_{0.75}Ca_{0\cdot25}(Cr_{1/2}Nb_{1/2})O_3$		Perovskite	48.0	3600	4.3	8	996
3245	$0.65CaTiO_3$-$0.35LaGaO_3$	1450/12h	Perovskite Orthorhombic	48.0	32000		2	1174
3246	$Ca[(Li_{1/3}Ta_{2/3})_{1-x}Ti_x]O_{3-\delta}$+3 wt% B_2O_3 (x=0.5)	1150	Perovskite	48.0	21000		–	765
3247	$Ca_5Nb_2TiO_{12}$	1550	Complex perovskite Orthorhombic Pnma	48.0	26600	3.7	40	1307
3248	$Ca_3Ba_2Ta_2TiO_{12}$	1540	Complex perovskite Cubic	48.0	3000	3.8	18	1307
3249	$Ba_3Ti_4Ta_4O_{21}$	1380	Hexagonal $P6_3/mcm$	48.0	7000	4.3	50	1208
3250	$(Ca_{1-0.3x}La_{0.2x})[(Mg_{1/3}Ta_{2/3})]_{1-x}Ti_xO_3$ (x=0.5)		Orthorhombic Pnnm complex Perovskite	48.0	21000		2	1387
3251	$Pr_{0.7}Gd_{0.3}TiNbO_6$	1400		48.0	4500		47	564
3252	$Ba_4SrNb_4O_{15}(A_nB_{n-1}O_{3n})$	1400	Hexagonal perovskite	48.0	14600	4.7	140	325
3253	$0.34CaTiO_3$-$0.66Ca(Mg_{1/3}Nb_{2/3})O_3$	1450	Perovskite	48.0	32500		−2	1388
3254	$CaTi_{0.5}(Al_{1/2}Nb_{1/2})_{.5}O_3$	1500/5h	Perovskite orthorhombic	48.0	26100	7	−4	1152
3255	$CaTi_{0.5}(Al_{1/2}Nb_{1/2})_{.5}O_3$+1 wt% Li_3NbO_4	1300/5h	Perovskite orthorhombic	48.0	32100	7	−2	1152
3256	$Ba_8Nb_4Ti_3O_{24}$	1450	Hexagonal $P6_3/mmc$	48.0	23500	5.5	115	1389
3257	$Sr_2La_4Ti_5O_{18}$	1625/2h		48.0	27350		20	895
3258	$Sr_5LaTi_2Nb_3O_{18}$	1520		48.0	27800	4.3		1390
3259	$Ba_4Sm_{9.33}Ti_{18}O_{54}$+15 wt % $BaCu(B_2O_5)$	950	Tungsten Bronze Orthorhombic	48.0	5500		−41	1391
3260	$(Ca_{1-0.3x}La_{0.2x})[Mg_{1/3}Ta_{2/3})O_3$ (x=0.5)		Orthorhombic Pbnm	48.0	21000			1387
3261	$[(Ca,Sr)_x(La,Nd)_{2/3-2x/3}]TiO_3$ (x=0.1)	1350/24h	Tetragonal I4/mcm	48.0	3700		61	1392
3262	$0.5La(Mg_{1/2}Ti_{1/2})O_3$-$0.5SrTiO_3$		Perovskite Pbnm	48.1	5800	6.6		978
3263	$Ba_3LaNb_3O_{12}$	1350/6h	Trigonal R-3m	48.3	38000	6.76	−40	1315
3264	$Ba_{2-x}Sr_xLa_3Ti_3NbO_{15}$ (x=0)	1480	Hexagonal perovskite	48.3	20290		8	1301
3265	$0.2SrTiO_3$-$0.8Ca_{0.61}Nd_{0.26}Ti_{1-x}Al_{4x/3}O_3$ (x=0.5)	1520/4h	Orthorhombic Perovskite	48.3	40700		4	1393
3266	$Ca_2Zn_4Ti_{16}O_{38}$	1100/4h	Trigonal R-3	48.4	31600	6.7	48	1394
3267	$Ca_5Nb_2TiO_{12}$+1 wt% SnO_2	1550/4h	Complex perovskite Orthorhombic Pnma	48.5	28000		36	1155
3268	$CaLa_8Ti_9O_{31}$	1550	Orthorhombic Pbam Perovskite	48.6	19350	3.65	−6	1272
3269	$Ba(Dy_{0\cdot3}Bi_{0.2}Nb_{0.5})O_3$	1300	Perovskite	48.6	2000		6	1341

3270	$0.64CaTiO_3$-$0.36LaGaO_3$	1300	Perovskite	48.7	38000			1395
3271	$Ca_5Nb_2TiO_{12}$+1 wt% Al_2O_3	1550/4h	Complex perovskite Orthorhombic Pnma	48.7	29000		33	1155
3272	$5.7Li_2O$-Nb_2O_5-$14.7TiO_2$+2 wt% B_2O_3-CuO	900		48.7	16350		32	760
3273	$Sr_2La_4Ti_5O_{18}$+0.3 wt% Bi_2O_3-B_2O_3 glass	1625/2h		48.7	23000		22	895
3274	$Ba_{(1-x)}Ca_x)La_4Ti_4O_{15}$ (x=0.4)	1575/4h	Trigonal perovskite P-3m1	48.9	42400		−7	1356
3275	$(Ba_{1-x}Ca_x)La_4Ti_4O_{15}$ (x=0.6)	1575	Trigonal perovskite P-3m1	48.9	41200		−7	1356
3276	$0.45La(Zn_{0.395}Ti_{0.385}Ta_{0.01}Al_{0.21})O_3$-$0.55CaTiO_3$		Composite	49.0	29000	1.957	0	1327
3277	$Ca_5Nb_2TiO_{12}$+1 wt% Cr_2O_3	1550/4h	Complex perovskite Orthorhombic Pnma	49.0	34000		44	1155
3278	$Ca_5Nb_2TiO_{12}$+1 wt% Sb_2O_3	1550/4h	Complex perovskite Orthorhombic Pnma	49.0	30500		36	1155
3279	$0.9Bi_2O_3$-$0.1Nb_2O_5$	900/3h	Flurite δ-Bi_2O_3 Fm-3m	49.0	800		−234	1396
3280	$Ca(Zr_{0.8}Ti_{0.2})O_3$		Perovskite orthorhombic Pcnm	49.0	10800			906
3281	$0.7CaTiO_3$-$0.3NdGaO_3$	1450/12h	Perovskite	49.0	32000		35	1174
3282	$0.66CaTiO_3$-$0.34(La_{0.5}Nd_{0.5})$ GaO_3	1540	Perovskite	49.0	43000		0	1269
3283	$11Li_2O$-$3Nb_2O_5$-$12TiO_2$+0.5 wt% B_2O_3	900	M phase+Li_2TiO_3	49.2	8840		58	1397
3284	$Ca_4La_2Ti_{5-x}(Mg_{1/3}Nb_{2/3})_xO_{17}$ (x=2)	1540	Orthorhombic Pbnm	49.2	16000		32	1152
3285	$Ca_2La_4Ti_5O_{18}$		Trigonal perovskite R	49.3	20100		6	1272
3286	$0.7CaTiO_3$-$0.3LaGaO_3$		Perovskite	49.4	29000	8	22	1269
3287	$CaTi_{0.53}Al_{1/2}Nb_{1/2})_{0.47}O_3$+1 wt% Li_3NbO_4	1300/5h	Perovskite Orthorhombic	49.4	31400	7	12	1152
3288	$Ba_3LiTa_3Ti_5O_{21}$	1200	Perovskite Hexagonal $P6_3/mcm$	49.4	3100		472	1398
3289	$(Ba_{1-x}Ca_x)La_4Ti_4O_{15}$ (x=0.8)	1575	Trigonal perovskite P-3m1	49.5	42400		−5	1356
3290	$Pr_{0.8}Gd_{0.2}TiNbO_6$	1400	Euxenite OrthorhombicPnma	49.5	9500		51	564
3291	$Ba_4LaNb_2TaO_{15}$		Hexagonal perovskite	49.5	24100		75	1355
3292	$(Ni_{1/3}Ta_{2/3})_{1-x}Ti_xO_2$ (x=0.4)	1300	Tetragonal $P4_2/mmm$	49.6	17600		40	1276
3293	$CaTi_{0.53}(Al_{1/2}Nb_{1/2})_{0.47}O_3$	1500/5h	Perovskite	49.8	26000	7	7	1152
3294	$Ba_3La_2Ti_2Nb_2O_{15}$ ($A_5B_4O_{15}$)	1460	Hexagonal perovskite	49.8	22000	5	7	1297

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
3295	$Li_{1+x+y}Ta_{1-x-3y}Ti_{x+4y}O_3$ (x=0.1, y=0.175)	1175/1h	M-Phase	49.8	10528		32	1399
3296	$Ba_6Ti_{14}Nb_2O_{39}$	1260/4h	Orthorhombic Bm21b	50.0	2600	4	165	1401
3297	$Ca[(Li_{1/3}Nb_{2/3})_{0.9}Ti_{0.3}]O_{3-d}$+1 wt% B_2O_3	940	Perovskite	50.0	6500		−8	1402
3298	$Pb_{0.7}Ca_{0.3}La_{0.5}(Mg_{1/2}Nb_{1/2})O_3$	1350/2h	Perovskite Cubic Fm3m	50.0	86000		0	1403
3299	$0.5La(Mg_{1/2}Ti_{1/2})O_3$-$0.5La_{2/3}TiO_3$	1400/2h	Perovskite	50.0	10000		5	1404
3300	$0.5CaTiO_3$-$0.5La(Zn_{1/2}Ti_{1/2})O_3$	1550/3h	Perovskite Orthorhombic	50.0	38000	7	0	1405
3301	$Ba_2Sr_3Nb_4O_{15}(A_nB_{n-1}O_{3n})$	1400	Hexagonal perovskite	50.0	16500	4.7	232	325
3302	$La_{0.33}TaO_3$	1525	Perovskite Tetragonal P4/mmm	50.0	8000	3.8	144	1406
3303	$Ca_5Nb_2TiO_{12}$+0.1 wt% $2MgO$-Al_2O_3-$5SiO_2$	1520/2h	Orthorhombic Pnma	50.0	30000	4	38	1407
3304	$TiTe_3O_8$	720	Cubic Ia3	50.0	30600	5	133	586
3305	$(1-x)(Mg_{0.95}Zn_{0.05})TiO_3$-$xCa_{0.6}La_{0.8/3}TiO_3$ (x=0.5)	1320/4h		50.0	43500		122	465
3306	$Ba_3Ti_2(Fe_{1/2}Nb_{1/2})Nb_4O_{21}$	1280	Hexagonal	50.0	5200		10	1408
3307	$Ba_3Ti_{4-x}(Mg_{1/3}Nb_{2/3})_xO_{21}$+$BaCu(B_2O_5)$ (x=2)	950	Hexagonal	50.0	10500		18	1409
3308	$Ca_{4-x}Mg_xLa_2T_5O_{17}$ (x=2)			50.0	9450		63	1029
3309	$Ca(Zr_xTi_{1-x})O_3$ (x=0.6)	1470/15h	Perovskite Orthorhombic Pbnm	50.0	3800	3.46	460	916
3310	$NiNb_2O_6$+40 wt% TiO_2	1300/2h	Composite	50.0	5700	6	99	1345
3311	$3Li_2O$-Nb_2O_5-$3TiO_2$+2 wt% B_2O_3-CuO	900	M phase+Li_2TiO_3	50.1	8300		35	1410
3312	$(1-x)La_{2/3}TiO_3$-$xNiTiO_3$ (x=0.2)	1340	Perovskite	50.7	13900	3.5	24	1411
3313	$Sr_5LaTi_2Nb_3O_{18}$	1520		50.7	27800		19	1412
3314	$Ba_{0.2}Sr_{0.8}La_4Ti_4O_{15}$+1 wt% La_2O_3-$0.5B_2O_3$-$0.5TiO_2$	1550/3h	Hexagonal perovskite	50.7	72700		−7	1413
3315	$Ba(Sm_{0.3}Bi_{0.2}Nb_{0.5})O_3$	1300	Perovskite	50.8	1600		14	1341
3316	$Ba_5SrNb_4TiO_{18}$	1450/4h		50.8	7000		83	895
3317	$0.75CaTiO_3$-$0.25SmAlO_3$	1450/12h	Perovskite Orthorhombic	51.0	31000		31	1174
3318	$0.7CaTiO_3$-$0.3SmGaO_3$	1450/12h	Perovskite Orthorhombic	51.0	18000		41	1174
3319	$Ba_3Sr_2Nb_4O_{15}(A_nB_{n-1}O_{3n})$	1400	Hexagonal Perovskite	51.0	21200	4.6	117	325
3320	$Ca_{0.6}(Li_{0.5}Nd_{0.5})_{.4})_{0.45}Zn_{0.55}TiO_3$	1150		51.0	12700		17	1281
3321	$Pr_{0.9}Gd_{0.1}TiNbO_6$	1400	Euxenite Orthorhombic Pnma	51.0	8400		53	564

3322	$Zr_{0.3}(Zn_{1/3}Nb_{2/3})_{0.7}TiO_4$	1290		51.0	26600		70	1414
3323	$Na_{1-x}K_xCa_4Nb_5O_{17}$ (x=1)	1300	MonoclinicP21/a $A_nB_nO_{3n+2}$	51.0	2300		473	1333
3324	$Sr_{0.5}Ba_{0.5}Ca_4Nb_4TiO_{17}$		Orthorhombic Pnnm	51.6	10200	5.37	−14	1415
3325	$0.3La(Mg_{1/2}Ti_{1/2})O_3$-$0.7CaTiO_3$	1500	Perovskite Pbnm	51.2	43800	5.8	–	932
3326	$3Li_2O$-Nb_2O_5-$3TiO_2$+1 wt% $0.83Li_2O$-$0.17V_2O_5$	900	M-Phase+Li_2TiO_3	51.3	7200		22	1416
3327	$TiFeNbO_6$+2 wt% Bi_2O_3	1125/5h	Tetragonal	51.3	1400	3.6	103	1379
3328	$(1-x)La_{2/3}TiO_3$-$xNiTiO_3$ (0.01)	1380	Perovskite	51.4	1600	3.55	25	1411
3329	$Ba_3La_2Ti_2Nb_2O_{15}$	1450		51.5			15	1417
3330	$Ca[(Ga_{1/2}Nb_{1/2})_{1-x}Ti_x]O_3$ (x=0.47)		Pbnm	51.6	34100		0	1418
3331	$(Pb_{0.2}Ca_{0.8})[(Ca_{1/3}Nb_{2/3})_{0.8}Ti_{0.2}]O_3$	1350/3h	Perovskite	51.7	7270		0	1419
3332	$Ba_{0.5}Ca_{0.5}(Fe_{1/2}Nb_{1/2})O_3$		Perovskite	51.7	960	6.9	45	1163
3333	$Bi_2(Zn_{1/3}Ta_{2/3})_2O_7$	850	Cubic Fd3m	51.8	2600		−26	1420
3334	$0.3LaAlO_3$-$0.7SrTiO_3$	1680	Perovskite	52.0	50800	9.3	56	832
3335	$(Li_{1/2}Sm_{1/2})TiO_3$	1300	Perovskite Orthorhombic	52.0	2290	3	−266	1421
3336	$Ca_4SrNb_2TiO_{12}$	1550	Orthorhombic Pnma	52.0	15000	3.59	42	1209
3337	$Ce_{0.33}TaO_3$	1525		52.0	10000	3.58	159	1406
3338	$NdTiNbO_6$	1370	Euxenite Orthorhombic Pnma	52.0	4480	4.93	46	563
3339	$Pr_{0.95}Gd_{0.05}TiNbO_6$	1370	Euxenite Orthorhombic Pnma	52.0	18500		54	564
3340	$CaTi_{0.6}(Al_{1/2}Ta_{1/2})_{0.4}O_3$	1500/15h	Perovskite Orthorhombic	52.0	13200	8	37	1266
3341	$0.7CaTiO_3$-$0.3LaGaO_3$	1450/12h	Perovskite	52.0	27000		40	1174
3342	$Ba_4LaTiNb_3O_{15}(A_5B_4O_{15})$	1450	Hexagonal perovskite	52.0	15600	4.47	93	1210
3343	$Ba_4Sm_{9.33}Ti_{18}O_{54}$+10 wt% $BaCu(B_2O_5)$	950	Orthorhombic	52.0	4000		−29	1422
3344	$Ba_{6-3x}Sm_{8+2x}Ti_{18}O_{54}$ (x=2/3)+3.5 Bi_2O_3-B_2O_3	1050	Tungsten bronze Orthorhombic	52.0	4500		6	1422
3345	$3Li_2O$-$Nb_2O_5$6TiO_2+21 wt% B_2O_3	900		52.0	12000		32	760
3346	$Ca_{5-x}Zn_xNb_4TiO_{17}$ (x=0.4)	1260	Perovskite $A_nB_nO_{3n+2}$	52.0	9950		−9	1423
3347	$Ba_{0.9}Ca_{0.1}(Fe_{1/2}Nb_{1/2})O_3$		Perovskite	52.1	620	6.8	45	1163
3348	$Pb_{0.4}Ca_{0.6}(Mg_{1/3}Nb_{2/3})_{1-x}Sn_x]O_3$ (x=0.1)	1280/2h	Perovskite Tetragonal	52.2	8150	5	−3	1424
3349	$CaTi_{0.5}$ ($Fé_{0.5}Nb_{0.5}$)$_{.5}O_3$+3 wt% B_2O_3	900/2h	Perovskite orthorhombic	52.3	2930		13	1425
3350	$0.4(La_{1/2}Na_{1/2})TiO_3$-$0.6Ca(Mg_{1/3}Nb_{2/3})O_3$	1450	Perovskite Orthorhombic	52.3	29700	6	2	1426

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
3351	$0.5Ca_{0.6}La_{0.267}TiO_3$-$0.5Ca(Mg_{1/3}Nb_{2/3})O_3$	1490/4h	Perovskite Composite	52.4	36400	5.8	3	1427
3352	$Sr_{1-x}Ca_xLa_4Ti_5O_{17}$ (x=0.85)	1580/6h	Orthorhombic Pnnm	52.4	12600		−23	1428
3353	$Sr_{1-x}Ca_xLa_4Ti_5O_{17}$ (x=1)	1580/6h	Orthorhombic Pnnm	52.7	12700		−37	1428
3354	(1-x)$Sr_{0.2}Na_{0.4}Sm_{0.4}TiO_3$-$SmAlO_3$ (x=0.25)	1470/4h	Orthorhombic perovskite	52.7	9700		2	1429
3355	$Pb_{0.2}Ca_{0\cdot8}(Fe_{1/2}Nb_{1/2})O_3$		Perovskite	53.0	10000	4.1	−69	996
3356	$Bi_2Ti_4O_{11}$	1100	Monoclinic C2/m	53.0	4900		−520	1372
3357	$Ba_3Ti_{4-x}(Zn_{1/3}Nb_{2/3})_xNb_4O_{21}$ (x=2),+1 wt% $MnCO_3$-CuO+1 wt% ZBS	900/2h		53.0	14600		6	1430
3358	$PrTiNbO_6$	1370	Euxenite Orthorhombic Pnma	53.0	12300	4.85	56	563
3359	$Ba_3Ti_{4-x}(Zn_{1/3}Nb_{2/3})_xNb_4O_{21}$ (x=2)+1 wt% ZBS+1 wt% $MnCO_3$-CuO	900/2h	Hexagonal $P6_3/mcm$	53.0	14600		6	1430
3360	$BaLa_4Ti_4O_{15}$ (textured)	1600/2h	Hexagonal Perovskite P-3m1	53.0	41400		−1	1431
3361	$(Ca_{1-x}Nd_{2x/3})TiO_3$ (x=0.3)+2 wt% CaO-ZnO-B_2O_3	900/1h	Perovskite Orthorhombic	53.0	3800		55	1432
3362	$Ca_{0.02}Zn_{1.98}Sn_{0.08}Ti_{1.92}Nb_2O_8$	1120/6h		53.1	48000	21		1433
3363	$0.8TiO_2$-$0.2Bi_2O_3$		Mixture phases	53.2	4500		−550	1434
3364	(1-x)$La_{2/3}TiO_3$-x$NiTiO_3$ (0.15)	1340	Perovskite	53.3	12950	3.4	21	1411
3365	$CaLa_4Ti_5O_{17}$	1550	Perovskite Orthorhombic Pnnm	53.7	17400	3.7	−26	1272
3366	$Sr_{1-x}Ca_xLa_4Ti_5O_{17}$ (x=1)	1580/6h	Orthorhombic Pnnm Perovskite	53.7	11500		−1	1428
3367	$0.8La_{2/3}TiO_3$-$0.2LaAlO_3$	1400	Perovskite Orthorhomic	53.9	29000	5.4	35	1096
3368	$CeTiNbO_6$	1360	Euxenite Orthorhombic Pnma	54.0	6530	4.4	67	563
3369	$0.4CaTiO_3$-$0.6Ca(Mg_{1/3}Nb_{2/3})O_3$	1450	Perovskite	54.0	32000	6.7	18	944
3370	$0.8La_{2/3}TiO_3$-$0.2LaAlO_3$	1400	Perovskite	54.0	29000		35	1096
3371	$Ca_3Sr_2Nb_2TiO_{12}$	1540	Orthorhombic Pnma	54.0	10000	3.5	45	1209
3372	Y_2O_3-$2TiO_2$	1460	Mixed phases	54.0	6565	4.65	−31	1435
3373	$Ba_{6-3x}Sm_{8+2x}Ti_{18}O_{54}$ (x=2/3)+3.5 wt% Bi_2O_3-B_2O_3+1.5 wt% LiF	1050	Tungsten Bronze Orthorhombic	54.0	3400		29	1422
3374	$(Ca_{0.85}Nd_{0.1})[Ti_{0.5}(Mg_{0.33}Nb_{0.67})_{0.5}]O_3$		–	54.1	7660		1	1436
3375	$0.48Nd(Zn_{1/2}Ti_{1/2})O_3$-$0.52SrTiO_3$	1350	Composite	54.2	84000		0	1437

3376	$Ca[Ti_{1-x}(Mg_{1/3}Nb_{2/3})_x]O_3$ (x=0.5)	14504h		54.3	22900		39	1271
3377	$Ba(Ti_{0.85}Mn_{0.15})O_3$+10 wt% B_2O_3	1100	Composite	54.4	3400		254	1319
3378	$Ba_{0·6}Ca_{0.4}(Fe_{1/2}Nb_{1/2})O_3$		Perovskite	54.5	600	6.6	55	1163
3379	$Ba(Ti_{0.85}Mn_{0.15})O_3$+15 wt% Bi_2O_3	900	Perovskite	54.7	1300		183	1319
3380	$Li_{1+x+y}Ta_{1-x-3y}Ti_{x+4y}O_3$ (x=0.1, y=0.15)	1175/1h	M-Phase	54.8	10400		34	1400
3381	$Ba[Zn_{1/4}Ti_{1/4}Nb_{1/2}]O_3$	1400	Perovskite cubic	54.8	13200	6.1		1228
3382	$CaLa_8Ti_9O_{31}$		Orthorhombic Pbam	54.9	19300		−6	1272
3383	$Li_{1+x-y}Nb_{1-x-y}Ti_{x+4y}O_3$ (x=0.1, y=0.175)	1100/1h	M-Phase	54.9	8890	6.2	28	1400, 1438
3384	$Ba_3LiNb_3Ti_5O_{21}$	1200	Hexagonal $P6_3/mcm$	54.9	3200		472	1398
3385	$Ba_{0.75}Sr_{0.25}$ $(Nd_{0.75}Bi_{0.25})_2Ti_4O_{12}$+20 wt% La_2O_3-B_2O_3-ZnO-CaO	900	Multiphase	54.9	2900		17	1439
3386	$Ga_{0.5}Nb_{0.5}TiO_4$	1250	Tetragonal P42/mnm	54.9	16600		165	1250
3387	$Ba_3Ti_4Nb_4O_{21}$	1270	Hexagonal $P6_3/mcm$	55.0	9500	5.5	100	1208
3388	$Sm_{(2-x)/3}Li_xTiO_3$ (x=0.5)	1350	Perovskite	55.0	2000		−260	1440
3389	$Ca[(Li_{1/3}Nb_{2/3})_{1-x}Ti_x]$ $O_{3-\delta}$ (x=0.5)	1150/3h	Perovskite	55.0	18600		83	752
3390	$0.2PbZrO_3$-$0.8Ca(Fe_{1/2}Nb_{1/2})O_3$	1250	Perovskite Orthorhombic Pbnm	55.1	450	5.3	−52	1164
3391	$Ba_4La_2Ti_3Nb_2O_{18}$	1450/6h	$A_nB_{n-1}O_{3n}$ perovskite Trigonal R-3m	55.1	21270	5.1		1441
3392	$Ca[(Li_{1/3}Nb_{2/3})_{1-x}Ti_x]O_3$ (x=0.5)	1150/3h	Perovskite	55.2	18600		83	752
3393	$CaLa_4Ti_5O_{17}$		Orthorhombic Pnnm	55.2	17400		−20	1272
3394	$(Zn_{1/3}Ta_{2/3})_{0.7}Ti_{0.3}O_2$	1200		55.3	17500		30	1442
3395	MBRT-90+10 wt% Li_2O-B_2O_3-SiO_2-(56.92:37.59)	875	Composite	55.3	2500		26	510
3396	$Ba_3LiNb_{3-x}Ta_xTi_9O_{21}$ (x=3)	1180	Hexagonal $P6_3/mcm$	55.6	18500		70	1443
3397	$CaTi_{.6}(Al_{1/2}Nb_{1/2})_{.4}O_3$	1500/5h	Perovskite Orthorhombic	55.7	21800	7	47	1152
3398	$Sr_{1-x}Ca_xLa_4Ti_5O_{17}$ (x=0.5)	1550/6h	Orthorhombic Pnnm	55.8	118000		9	1428
3399	$CaLa_4Ti_{4.95}Zr_{0.05}O_{17}$	1500/4h	Orthorhombic Pnnm	55.9	15600		5	1444
3400	$Ba_{6-3x}Sm_{8+2x}Ti_{18}O_{54}$ (x=2/3)+5 wt% Bi_2O_3-B_2O_3	1050	Tungsten bronze Orthorhombic	56.0	4300		−15	1422
3401	$Ba_{6-3x}Sm_{8+2x}Ti_{18}O_{54}$ (x=2/3)+3.5 wt% Bi_2O_3-B_2O_3+01LiF	1050	Tungsten bronze Orthorhombic	56.0	3900		23	1422

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
3402	$0.64BaTi_4O_9$-$0.35BaPr_2Ti_4O_{19}$		Composite	56.0	1000			1445
3403	$(Sr_{0.1}Ca_{.9})_3Ti_2O_7$		Orthorhombic $Ccm2_1$	56.0	3000	2.5	141	1358
3404	$BaTi_3Nb_4O_{17}$	1310/4h	Orthorhombic Bbmm	56.0	8400	4	86	1401
3405	$BaTi_{0.95}Ni_{0.05}O_{3-\delta}$	1450/2h	Perovskite	56.0	2400			1446
3406	Bi_2TeO_6 (oxygen atm)	720/15h	Orthorhombic Cmca	56.0	10400		−49	1068
3407	$TiFeNbO_6$+4 wt% Bi_2O_3	1125/5h	Tetragonal	56.1	1000	3.45	17	1379
3408	$Li_{1+x-y}Nb_{1-x-y}Ti_{x+4y}O_3$ (x=0.1, y=0.15)	1100/1h	M-Phase	56.2	8350	6	15	1400, 1438
3409	0.5$MgTiO_3$-0.5$CaTiO_3$-0.25(Nd_2O_3-$2TiO_2$)		Composite	56.3	23500		68	1383
3410	$Ca_{0.99}Mg_{0.01}La_4Ti_5O_{17}$	1500	Orthorhombic Pnnm	56.3	12300	6.4	−10	1447
3411	$Ni_{0.5}Ti_{0.5}NbO_4$+2 wt% ZnO	930/6h	Tetragonal $P4_2/mnm$	56.3	67000		78	1448
3412	$Ca_{1-x}Zn_xLa_4Ti_5O_{17}$ (x=0)	1500/4h	Orthorhombic Pnnm	56.5	12500	6.6	4	1449
3413	$Li_{1+x-y}Nb_{1-x-3y}Ti_{x+4y}O_3$ (x=0.1, y=0.1)	1150/10h		56.5	4500		−7	1450
3414	$Sr_{1-x}Ca_xLa_4Ti_5O_{17}$ (x=0.25)	1150/6h	Orthorhombic Pnnm	56.5	10960		39	1428
3415	$CaTi_{.6}(Al_{1/2}Nb_{1/2})_{.4}O_3$+1 wt% Li_3NbO_4	1300/5h	Perovskite Orthorhombic	56.6	28000	7	53	1152
3416	$Ba_xLa_4Ti_{3+x}O_{12+3x}$ (x=3)			56.6	13380		−191	1310
3417	$Ca_{0.97}Mg_{0.03}La_4Ti_5O_{17}$	1450	Orthorhombic Pnnm	56.7	10800	5.3	−16	1447
3418	$Ni_{0.5}Ti_{0.5}NbO_4$	1100/6h		56.8	21100		79	1448
3419	0.7$CaTiO_3$-0.3$Sm(Mg_{0.5}Ti_{0.5})O_3$	1550	Composite	57.0	11150	4.1	54	865
3420	$La_{0.4}Ba_{0.6}Ti_{0.6}Y_{0.4}O_3$	1600/4h		57.0	750		12	1451
3421	Bi_2O_3-CaO-Nb_2O_5 (46.15:23.08:30.77)	950		57.0	470	3.7	24	1452
3422	$Ca_{1-x}Zn_xLa_4Ti_5O_{17}$ (x=0.025)	1500/4h	Orthorhombic Pnnm	57.0	17400	6.7	8	1449
3423	$Ca_{0.99}Zn_{0.01}La_4Ti_5O_{17}$+0.5 wt% CuO	1450	Orthorhombic Pnnm	57.0	15000		−8	1453
3424	$CaLa_4Ti_5O_{17}$	1500	Perovskite Pnnm Orthorhombic	57.0	9000		−10	1454
3425	$Ba_5LaTi_2Nb_3O_{15}$	1420/6h	$A_nB_{n-1}O_{3n}$ perovskite Trigonal R-3m	57.3	18450	4.7		1441
3426	$SrLa_4Ti_{4.9}Zr_{0.1}O_{12}$		Orthorhombic	57.3	9800		70	1455
3427	$Pb_{0.4}Ca_{0.6}(Mg_{1/3}Nb_{2/3})_{1-x}$ $Sn_x]O_3$ (x=0.05)	1280	Perovskite tetragonal	57.4	8120	5	−4	1424
3428	$Ca_{1-x}Zn_xLa_4Ti_5O_{17}$ (x=0.01)	1450	Orthorhombic Pnnm	57.6	17100		5	1449

3429	$Ba_{0.7}Ca_{0.3}(Fe_{1/2}Nb_{1/2})O_3$		Perovskite	57.7	830	7.8	101	1163
3430	$0.85La_{2/3}TiO_3$-$0.15LaAlO_3$	1375	Perovskite Orthorhomic	57.7	27900	5.2	65	1096
3431	$(Zn_{1/3}Nb_{2/3})_{0.4}(Ti_{0.7}Sn_{0.3})_{0.6}O_2$	1150/3h		57.8	14800		58	1456
3432	$Sr_3Ti_2O_7(Sr_{n+1}Ti_nO_{3n+1})$		Perovskite Tetragonal I4/mmm	57.9	18850	2.5	317	1358
3433	$Sr_{2.4}Ca_{0.6}Ti_2O_7$	1600	Tetragonal I4/mmm	57.9	25700	2.5	359	1222
3434	$LiNb_{0.6}Ti_{0.5}O_3$ textured		Not available	57.9	6325		−14	1457
3435	$Ba_{6-3x}Sm_{8+2x}Ti_{18}O_{54}$ (x=2/3)+3.5 wt% Bi_2O_3-B_2O_3+0.5 wt% LiF	1050	Tungsten bronze Orthorhombic	58.0	4500		6	1422
3436	$(Sr_{0.8}Ca_{0.2})_3Ti_2O_7$		Tetragonal I4/mmm	58.0	2500	2.5	359	1358
3437	$0.8Ca_{0.85}Nd_{0.1}TiO_3$-$0.2SmAlO_3$	1400	Perovskite	58.0	14000		13	1458
3438	$4CaO$-BaO-Nb_2O_5-TiO_2	1490	Composite	58.0	4000	3.4	44	1307
3439	Bi_2O_3-CaO-Nb_2O_5 (45.75:21.75:32.5)	1050	Composite	58.0	1060	3.8	20	1452
3440	$(1-x)La_{2/3}TiO_3$-$xNiTiO_3$ (0.075)	1340	Perovskite	58.0	15000	3.4	22	1411
3441	$TiFeNbO_6$+6 wt% Bi_2O_3	1125/5h	Tetragonal	58.1	650	3.32	118	1379
3442	$(Ni_{1/3}Ta_{2/3})_{1-x}Ti_xO_2$ (x=0.5)	1300	Rutile Tetragonal $P4_2/mmm$	58.3	13900		86	1276
3443	$Li_{1+x-y}Nb_{1-x-y}Ti_{x+4y}O_3$ (x=0.05, y=0.1)	1100/1h	M-Phase	58.4	6230	6.3	−31	1400, 1438
3444	$0.3La(Mg_{1/2}Ti_{1/2})O$-$0.7CaTiO_3$	1500	Perovskite Pbnm	58.8	40390	5.5	71	932
3445	$0.8Ca_{0.85}Nd_{0.0.1}TiO_3$-$0.2SmAlO_3$		Perovskite Orthorhombic	58.9	14600		13	1458
3446	$Li_{1+x+y}Ta_{1-x-3y}Ti_{x+4y}O_3$ (x=0.1, y=0.1)	1175/1h	M-Phase	58.9	7720		26	1400, 1438
3447	$0.42(La_{1/2}Na_{1/2})TiO_3$-$0.58Ca(Fe_{1/2}Nb_{1/2})O_3$	1300/10h	Complex perovskite Orthorhombic	58.9	14070	6.6	0	1459
3448	$Pb_{0.4}Ca_{0\cdot6}(Ni_{1/3}Nb_{2/3})O_3$		Perovskite	59.0	7100	4.2	6	996
3449	$Bi_{18}Ca_8Nb_{12}O_{65}$	950		59.0	610	3.7	25	1452
3450	$Ca(Zr_xTi_{1-x})O_3$ (x=0.5)	1470/15h	Perovskite Orthorhombic Pbnm	59.0	4400	3.14	459	916
3451	$(1-y)Li_{2.02}Ti_{0.92}Nb_{0.06}O_3$ (y=0.8)	1070		59.1	6900		36	722
3452	$Li_{1+x-y}Nb_{1-x-y}Ti_{x+4y}O_3$ (x=0.1, y=0.125)	1100/1h	M-Phase	59.2	7560	6	22	1400, 1438
3453	$Ca_4La_2Ti_{5-x}(Mg_{1/3}Nb_{2/3})_xO_{17}$ (x=1)	1540	Orthorhombic Pbnm	59.3	15500		72	1118
3454	$Ba_{0.8}Ca_{0.2}(Fe_{1/2}Nb_{1/2})O_3$		Complex Perovskite	59.5	550	6.3	80	1163
3455	$(1-x)La_{2/3}TiO_3$-$xNiTiO_3$ (0.05)	1360	Perovskite	59.6	14860	3.2	22	1411

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
3456	$Li_{1+x+y}Ta_{1-x-3y}Ti_{x+4y}O_3$ (x=0.15, y=0.1)	1175/1h	M-Phase	59.6	9100		42	1400, 1438
3457	$Pb_{0.25}Ca_{0.75}[(Mg_{1/3}Nb_{2/3})_{0.75}Ti_{0.25}]O_3$		Perovskite	60.0	11000		0	1460
3458	$Ba(Ti_{0.85}Mn_{0.15})O_3$	1400	Perovskite	60.0	12000		225	1461
3459	$BaSm_2Ti_4O_{12}$+16 mol% $BaCuB_2O_5$	875	Tungsten-Bronze Orthorhombic	60.0	4500		−30	1462
3460	$Ba_4Sm_{9.33}Ti_{18}O_{54}$+8 wt% $BaCu(B_2O_5)$	1050	Tungsten Bronze Orthorhombic	60.0	4100		−26	1391
3461	$(Sr_{0.2}Ca_{0.8})_3Ti_2O_7$		Orthorhombic $Ccm2_1$	60.0	2630	2.5	232	1358
3462	$0.5CaTiO_3$-$0.5Sr(Mg_{1/3}Nb_{2/3})O_3$	1600	Perovskite	60.0	14000		60	1347
3463	$BaNd_2Ti_3O_{10}$		Tungsten bronze	60.0	5300	4.2	140	1463
3464	$Ca_2Sr_3Nb_2TiO_{12}$	1530	Orthorhombic	60.0	6000	3.5	48	1209
3465	$(Ca_{1-x}Nd_{2x/3})TiO_3$ (x=0.3)+25 vol% $3ZnO$-$2B_2O_3$	900	Perovskite	60.0	3700		62	1004
3466	$Ba_3LiNb_2Sb_3Ti_5O_{21}$	1140		60.0	14000		143	923
3467	$Ca[Ti_{0.4}(Mg_{1/3}Ta_{2/3})_{0.6}]O_3$	1350	Perovskite Orthorhombic	60.2	36900		−10	1464
3468	$Ba_3LiNb_{3-x}Ta_xTi_9O_{21}$ (x=2)		Hexagonal $P6_3/mcm$	60.3	15100		100	1443
3469	$Li_{1+x+y}Ta_{1-x-3y}Ti_{x+4y}O_3$ (x=0.1, y=0.075)	1175/1h	M-Phase	60.5	5014		−5	1399, 1400
3470	$7NiNb_2O_6$-$9TiO_2$+3.2 wt% CuO	935	Composite	60.5	1040		62	1465
3471	$0.42(La_{1/2}Na_{1/2})TiO_3$-$0.58Ca(Fe_{1/2}Nb_{1/2})O_3$	1350/10h	Complex perovskite Orthorhombic	60.6	1300	6.6	6.5	1459
3472	$Nd_{0.5}Ti_{0.5}NbO_4$	1140/6h	Tetragonal $P4_2/mnm$	60.6	70100		76	1448
3473	$Ba(Pr_{0.3}Bi_{.02}Nb_{0.5})O_3$	1300	Perovskite	60.7	1500		15	1341
3474	$Sr_{1-x}Ca_xLa_4Ti_5O_{17}$ (x=0)	1500/6h	Orthorhombic Pnnm	60.8	9970		117	1428
3475	$0.5BaTiO_3$-$0.5La(Mg_{1/2}Ti_{1/2})O_3$		Perovskite I4/mcm	60.9	9600	5.2	−2	933
3476	$Ca_2Ba_3Ta_2TiO_{12}$	1525	Cubic perovskite	61.0	1800	3.4	21	1307
3477	$0.2Li_2O$-$0.62Nb_2O_5$-$0.17TiO_2$	1350		61.0	15000		100	760
3478	$_x(Ba_4Nd_{9.33}Ti_{18}O_{54})$-(1-x)$BaLa_4Ti_4O_{15}$ (x=0.75)+Bi_2O_3-B_2O_3-ZnO-SiO_2 glass	1140	Composite	61.0	2300		38	1466
3479	$Ba_4(Sm_{0.5}Nd_{0.5})_{28/3}Ti_{18}O_{54}$+2mol% TiO_2+2 wt% Li_2O-Al_2O_3-B_2O_3 glass		Tungsten Bronze Orthorhombic	61.1	5900		17	1467

3480	$CoTiNb_2O_8$+2 wt% CuO	950	Tetragonal rutile P42/mnm	61.5	15900		42	1468
3481	MBRT-90+10 wt% Li_2O-B_2O_3-SiO_2-CaO-Al_2O_3 (52.45::31.06:11.99:2:2.5)	875	Composite	61.6	2500		18	510
3482	$(Pb_{0.4}Ca_{0.6})(Fe_{1/2}Ta_{1/2})O_3$	1050/3h	Complex perovskite cubic Pm3m	62.0	9000		−15	1469
3483	$0.83Bi_2O_3$-$0.25Nb_2O_5$	900/3h	Flourite Fm-3m	62.0	560		−372	1396
3484	$CaSr_4Nb_2TiO_{12}$	1530		62.0	11500	3.4	51	1209
3485	$Li_{1+x+y}Ta_{1-x-3y}Ti_{x+4y}O_3$ (x=0.15, y=0.075)	1175/1h	M- Phase	62.1	6190		13	1399, 1400
3486	$Li_{1+x-y}Nb_{1-x-y}Ti_{x+4y}O_3$ (x=0.1, y=0.05)	1100/1h	M-Phase	62.4	3750	6.	−53	1399, 1400
3487	$Ba_{0.725}Ca_{0.275}(Fe_{1/2}Nb_{1/2})O_3$		Perovskite	62.4	640	6.3	82	1163
3488	$Ni_{0.3}Zn_{0.2}Ti_{0.5}NbO_4$	1120		62.5	13500	TCF65		1470
3489	$0.9La_{2/3}TiO_3$-$0.1LaAlO_3$	1350	Perovskite Orthorhomic	62.6	26100	4.9	82	1096
3490	$Ca[Ti_{1-x}(Mg_{1/3}Nb_{2/3})_x]O_3$ (x=0.4)	14504h	Perovskite	62.9	12200		92	1271
3491	$Pb_{0.4}Ca_{0.6}(Mg_{1/3}Nb_{2/3})_{1-x}$ $Sn_x]O_3$ (x=0.03)	1280	Perovskite Tetragonal	63.0	7540	5	−4	1424
3492	$Ba_{6-3x}Sm_{8+2x}Ti_{18}O_{54}$ (x=2/3)+3 wt% Bi_2O_3-B_2O_3	1100	Tungsten Bronze	63.0	8500		−19	1422
3493	(1-x)$BaLa_4Ti_4O_{15}$-x$Ba_4Nd_{9.333}Ti_{18}O_{54}$ (x=0.55)		Composite	63.0	10000		−20	1471
3494	$0.9La_{2/3}TiO_3$-$0.1LaAlO_3$	1350	Perovskite	63.0	26100		82	1096
3495	$Bi_2Zn_{2/3}Ta_{4/3}O_7$+0.05 wt% CuO+0.05 wt% V_2O_5	930		63.0	6800	5.35		1472
3496	$Ba_3La_4Ti_6O_{21}$			63.0	9100		198	1473
3497	(1-x)$La_{2/3}TiO_3$-x$NiTiO_3$ (x=0.02)	1380	Perovskite	63.3	6210	3.3	22	1411
3498	$0.4Ba(Mg_{1/2}W_{1/2})O_3$-$0.6BaTiO_3$	1500/6h	Perovskite Hexagonal	63.9	3800		303	373
3499	$CaBa_4Ta_2TiO_{12}$	1500	Cubic perovskite	64.0	1400	3.6	24	1307
3500	$Pb_2Ta_{1.5}Nb_{0.5}O_7$		Hexagonal	64.0	12800		223	1474
3501	Ba_{6-3x} $Sm_{8+2x}Ti_{18}O_{54}$x-$_{2/3}$+3 wt% Al_2O_3-B_2O_3-SiO_2	1175	Tungsten Bronze Orthorhombic	64.0	8500	–	0	1475

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
3502	$Li_{1+x-y}Nb_{1-x-y}Ti_{x+4y}O_3$ (x=0.15, y=0.075)	1100/1h	M-phase	64.0	4610	5.9	−15	1438
3503	$Co_{0.5}Ti_{0.5}NbO_4$	1120	Tetragonal $P4_2/mnm$	64.0	65300		223	1179
3504	$0.84CaTiO_3$-$0.16Sm_{0.9}Nd_{0.1}AlO_3$+0.4 wt% MgO	1375/3h		64.2	30900		26	1476
3505	$Pb_{.4}Ca_{.6}(Mg_{1/3}Nb_{2/3})_{1-x}$ $Sn_x]O_3$ (x=0.01)	1280	Perovskite Tetragonal	64.7	7130	5	0	1424
3506	$LiNb_{0.6}Ti_{0.5}O_3$+0.5 wt% 0.17 Li_2O-$0.83V_2O_5$	850		64.7	5900		9	1450
3507	$Li_{1+x-y}Nb_{1-x-y}Ti_{x+4y}O_3$ (x=0.1, y=0.1)	1100/1h	M-Phase	64.8	6385	5.7	8	1399, 1400
3508	$La_{2/3}TiO_3$		Perovskite Orthorhombic Pbnm	65.0	15700			1477
3509	$La_{0.4}Ba_{0.6}Ti_{0.6}Yb_{0.4}O_3$	1600/4h	Not available	65.0	4500		1	1451
3510	$Ba_3Ti_4Nb_4O_{21}$+3 wt% CuO+1 wt% B_2O_3	900/2h	Hexagonal $P6_3/mcm$	65.0	16000		101	1478
3511	$Ba_4(Nd_{0.85}Bi_{0.015})_{9.33}Ti_{18}O_{54}$+30 wt% Li_2O-ZnO-B_2O_3	875	Composite	65.0	2500	5.5	35	1479
3512	$(Pb_{0.4}Ca_{0.6})[(Mg_{1/2}Nb_{1/2})O_3Sn_x]$ (x=0.01)	1350	Perovskite	65.0	7100		136	1424
3513	$Ba_4Sm_{9.33}Ti_{18}O_{54}$+6 wt% $BaCu(B_2O_5)$	1075	Orthorhombic	65.0	4200		−24	1391
3514	$Ba[Ti_{1-x}(Co_{0.5}W_{0.5})_xO_3$ (x=0.4)		Perovskite	65.0	3000		45	519
3515	$0.1Pb(Fe_{2/3}W_{1/3})O_3$-$0.9Pb_{0.2}Ca_{0.8}(Fe_{1/2}Nb_{1/2})O_3$	1000	Perovskite	65.3	2270		−24	1480
3516	$CaTi_{0.7}(Al_{1/2}Ta_{1/2})_{0.3}O_3$	1500/15h	Perovskite Orthorhombic	65.4	20000	8	113	1266
3517	$CaTi_{0.7}(Al_{1/2}Nb_{1/2})_{0.3}O_3$	1450/5h	Perovskite Orthorhombic	65.4	19300	7	−2	1152
3518	$0.5CeO_2$-$0.25CaO$-$0.25TiO_2$	1550	Mixture phases	65.5	9500	3.2	399	488
3519	$Ca_3Ba_2Nb_2TiO_{12}$	1475	Cubic perovskite	66.0	2600	3.3	48	1307
3520	$(1-x)(Mg_{0.95}Zn_{0.05})TiO_3$-$xCa_{0.6}La_{0.8/3}TiO_3$ (x=0.7)	1320/4h	Composite	66.0	39000		168	465
3521	$BaTi_{0.4}Ga_{0.3}Nb_{0.3}O_3$	1500/4h	Perovskite Tetragonal P4mm	66.0	3720	4.7		1373
3522	$LiNb_{0.6}Ti_{0.5}O_3$)+2 wt% V_2O_5	900/1h	M-Phase	66.0	3800	5.6	11	1450
3523	Bi_2O_3-CaO-Nb_2O_5 (52.5:17.5:30)	925		66.0	330	3.6	35	1452
3524	$Ba_3Ti_4Nb_4O_{21}$+0.2$MnCO_3$-0.8CuO	950	Hexagonal $P6_3/mcm$	66.0	13400		60	1481
3525	$LiNb_{0.6}Ti_{0.5}O_3$+1 wt% LBS glass	900	Rhombohedral	66.2	5200	4.3	19	1482

3526	$Pb_{0.4}Ca_{0.6}(Mg_{1/3}Nb_{2/3})\ O_3$	1280	Perovskite Tetragonal	66.3	6940	5	3	1424
3527	$Bi_2(Zn_{1/3}Ta_{2/3})_2O_7$	850	Cubic Fd3m	66.3	6200		−9	1472
3528	$(Ni_{1/3}Ta_{2/3})_{1-x}Ti_xO_2$ (x=0.6)	1300	Rutile Tetragonal $P4_2/mmm$	66.4	2180		147	1276
3529	$Ba_{4.2}Nd_{9.2}Ti_{18}O_{54}$+13 wt% $NdAlO_3$+0.3 wt% MnO_2	1380/2h	Tungsten Bronze	66.5	14000		0	1483
3530	$0.92La_{2/3}TiO_3$-$0.08LaAlO_3$	1350	Perovskite Orthorhombic	66.9	28350	4.8	82	1096
3531	$(Ba_{4.2}Sm_{9.2})Ti_{16.6}Al_{1.4}O_{54}$	1440	Tungsten Bronze	67.0	1543	5.4	−90	1484
3532	$BaNd_2Ti_4O_{12}$+B_2O_3-Bi_2O_3-SiO_2-ZnO glass+La_2O_3-B_2O_3-TiO_2	900	Tungsten Bronze	67.0	6000	6	4	1485
3533	$(Ca_{0.3}Li_{0.14}Sm_{0.42})TiO_3$-$Mg_{0.93}Ca_{0.07}TiO_3$ stacked layers	1350	Stacked layers	67.2	7900		0	719
3534	$ZrTe_3O_8$	760/15h	Cubic Ia3	67.5	1800	4	362	53, 62
3535	$CaTi_{0.7}(Al_{1/2}Nb_{1/2})_{0.3}O_3$	1500/5h	Perovskite	67.8	18700		138	1152
3536	$0.8CaTiO_3$- $0.2Sm(Mg_{0.5}Ti_{0.5})O_3$	1550	Perovskite	68.0	12400	3.5	147	865
3537	$Ba_{6-3x}(Sm_{1-y}Nd_y)_{8+2x}(Ti_{1-z}Sn_z)O_{54}$ (x=2/3, y=0, z=0.1)		Tungsten bronze	68.0	4020		20	1486
3538	$0.6CaTiO_3$-$0.4Ca(Mg_{1/3}Nb_{2/3})O_3$	1450	Perovskite	68.0	17000	5.4	108	944
3539	$BiVO_4$	900	Monoclinic I2/b	68.0	8000		−243	1487
3540	$0.3La(Mg_{1/2}Ti_{1/2})O_3$-$0.7SrTiO_3$		Perovskite Imma	68.4	4950	6.6		978
3541	$(Pb_{1-x}Ca_x)[Fe_{1/2}Nb_{1/2}]_{1-y}Zr_yO_3$ (y=0.01, x=0.6)	1150	Perovskite	68.7	6800	4.2	−17	1488
3542	$(Ni_{1/3}Nb_{2/3})_{1-x}Ti_xO_2$ (x=0.3)	1200	Rutile Tetragonal $P4_2/mmm$	68.7	19300		57	1276
3543	$(Ca_{0.2}Sr_{0.8})_3Ti_2O_7$	1460/2h	Tetragonal I4/mmm	68.8	10600			1489
3544	$Ba_4(Sm_{0.5N}d_{0.5})_{28/3}Ti_{18}O_{54}$+$2TiO_2$+5 wt% K_2O-B_2O_3-SiO_2 glass	1075/3h	Orthorhombic Tungsten Bronze	68.8	6800		29	1490
3545	$Ba_4Gd_9Ti_{18}O_{54}$	1350/10h	Orthorhombic Pbam	69.0	3300	1	−60	1491
3546	$CaTi_{0.7}(Al_{1/2}Nb_{1/2})_{0.3}O_3$+1 wt% Li_3NbO_4	1300/5h	Perovskite Orthorhombic	69.0	21500	7	145	1152
3547	(1-x)$La_{2/3}TiO_3$-x$NiTiO_3$ (0.03)	1375	Perovskite	69.4	16960	3.1	18	1411
3548	$Ba_{2-x}Sm_{(4+2/3x)}Ti_9O_{26}$ (x=0.3)	1360/4h	Tunsten Bronze	69.4	9700		6	1493
3549	$(Ba_{4.2}Sm_{.9.2})_aTi_{17.}AlO_{54}$	1440	Tungsten Bronze	70.0	4360	5.22	−57	1484

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
3550	$LiNb_{0.6}Ti_{0.5}O_3$+1 wt% ZnO-B_2O_3	900	M phase solid solution	70.0	5900		−5	1493
3551	$Ba_4Nd_{9.33}Ti_{18}O_{54}$+2 wt% Al_2O_3	1320/4h	Tungsten Bronze	70.0	12200		20	1494
3552	$Ba_{6-3x}Sm_{8+2x}Ti_{18}O_{54}$ (x=2/3)+1 wt% Bi_2O_3-B_2O_3	1200	Tungsten Bronze	70.0	8500		−13	1422
3553	$Bi_2(Zn_{1/3}Nb_{2/3})_2O_7$+1 wt% of 0.15CuO-0.85$MoO_3$	900		70.0	4800	3		1495
3554	Ba_{6-3x} $Sm_{8+2x}Ti_{18}O_{54}$ (x=2/3)+0.5 wt% (50Al_2O_3-50 SiO_2)	1220	Tungsten Bronze	70.0	8500	–	−21	1475
3555	$Ba_4Sm_{9.33}Ti_{18}O_{54}$+4 wt% $BaCu(B_2O_5)$	1175	Tungsten Bronze	70.0	4700		−16	1391
3556	0.97$La_{2/3}TiO_3$-0.03$NiTiO_3$	1350		70.0	17000		18	1411
3557	Ba_{6-3x} $Sm_{8+2x}Ti_{18}O_{54}$ (x=2/3)+0.5 wt% (44Al_2O_3-30B_2O_3-26SiO_2)	1220	Tungsten Bronze	70.0	8600	–	−12	1475
3558	$LiNb_{0.6}Ti_{0.5}O_3$+1 wt% B_2O_3	880		70.0	5400		−6	1496
3559	$(Ba_{4.2}Sm_{9.2})_\propto Ti_{18-y}Al_yO_{54}$ (y=1, ∝=1+y/36, x=0.6)	1440	Tungsten Bronze	70.2	4350		−57	1484
3560	$Pb_{0.4}Ca_{.6}[(Fe_{1/2}Nb_{1/2})_{0.9}Sn_{0.1}O_3$	1150/3h	Perovskite Orthorhombic	70.3	8200		−19	1497
3561	0.1$CaTiO_3$-0.5$(Li_{1/2}Nd_{1/2})TiO_3$-0.4$(Dy_{1/3}Nd_{1/3})TiO_3$	1350/3h	Tetragonal P-4b2 Perovskite	70.6	1470		−156	1498
3562	Ba_{6-3x} $Sm_{8+2x}Ti_{18}O_{54}$ (x=2/3)+0.5 wt% (22MgO-22Al_2O_3-56SiO_2)	1200	Tungsten Bronze	71.0	5890	–	−19	1475
3563	Ba_{6-3x} $Sm_{8+2x}Ti_{18}O_{54}$ (x=2/3)+0.5 wt% (35Bi_2O_3- 32ZnO- 6SiO_2-27B_2O_3)	1200	Tungsten Bronze Perovskite	71.0	8900	–	−10	1475
3564	0.14(BaO-Nd_2O_3-4TiO_2)-+0.86(BaO-Al_2O_3- 4TiO_2)			71.0	8200	–	0	1111
3565	$Ba\{Ti_{0.95}Mn_{0.05}\}O_{3-\delta}$	1450/2h	Perovskite	71.1	7700	4.8		1446
3566	$Ba[Ti_{1-x}(Zn_{1/2}W_{1/2})_x]O_3$ (x=0.4)	1420	Cubic perovskite Pm3-m	71.2	4800		48	695
3567	$Cu_{0.5}Ti_{0.5}NbO_4$	960/6h	Tetragonal rutle	71.2	11000		49	1499
3568	SrO-2CeO_2-4TiO_2	1330/3h	Tetragonal	71.3	10400		187	1500
3569	0.2$Pb(Fe_{2/3}W_{1/3})O_3$-0.8$Pb_{.2}Ca_{.8}(Fe_{1/2}Nb_{1/2})O_3$	1000	Perovskite	71.4	1520		−29	1480
3570	$Ba_{(2-x)}Sm_{(4+2/3x)}Ti_9O_{24}$ (x=0.25)	1370		71.5	10700	5.1	4	1501

3571	$Ca_{0.66}La_{0.387}Ti_{0.88}O_3$	1550	Orthorhombic Pbnm	71.5	13400		136	1502
3572	$0.2Ca_{0.8}Sr_{0.2}TiO_3$-$0.8Li_{0.5}Sm_{0.5}TiO_3$+5 wt% $BaCu(B_2O_5)$+1.5 wt% TiO_2	950		71.6	3400		−11	1503
3573	SrO-$2CeO_2$-$5TiO_2$	1330/3h	Mixed phases	71.7	6670		203	1500
3574	$LiNb_{0.63}Ti_{0.4625}O_3$+0.1 wt% B_2O_3-SiO_2	900		71.7	4950		−2	1504
3575	(1-x)$Ca_{0.61}Nd_{0.26}TiO_3$-xNd$(Zn_{0.5}Ti_{0.5})O_3$+x=0.2	1300	Perovskite	71.8	17300		94	1505
3576	$0.92BiVO_4$–$0.08Li_{0.5}Nd_{0.5}WO_4$	750	Monoclinic	71.8	7500		1	1506
3577	$0.96La_{2/3}TiO_3$-$0.04LaAlO_3$	1325	Perovskite Orthorhomic	71.9	23900	4.5	123	1096
3578	$Pb_{0.5}Ca_{0.5}(Na_{1/4}Nb_{3/4})O_3$		Perovskite	72.0	1500	3.5	230	996
3579	$Ba_4Sm_{9.33}Ti_{18}O_{54}$+2 wt% $BaCu(B_2O_5)$	1175	Orthorhombic	72.0	5500		−14	1391
3580	$Pb_{0.5}Ca_{0.5}(Zr_{0.95}Ti_{0.05})O_3$	1350	Perovskite Rhombohdral	72.0	4100	4	2	1507
3581	$0.96La_{2/3}TiO_3$-$0.04LaAlO_3$	1325	Perovskite	72.0	24000		123	1096
3582	$Ba_{6-3x}Sm_{8+2x}Ti_{18}O_{54}$ (x=2/3)+0.5 wt% $(60ZnO$-$30B_2O_3$-$10SiO_2)$	1200	Tungsten-bronze Orthorhombic	72.0	4530	–	−17	1475
3583	$Ba_{6-3x}Sm_{8+2x}Ti_{18}O_{54}$ (x=2/3)+0.5 wt% $(40MgO$-$40B_2O_3$-$20SiO_2)$	1200	Tungsten-Bronze Orthorhombic	72.0	4450	–	−16	1475
3584	Ba_{6-3x} $Sm_{8+2x}Ti_{18}O_{54}$-$1.9TiO_2$ (x=2/3)	1350/2h	Tungsten Bronze	72.0	10300		7.2	1508
3585	$(Ba_{4.2}Sm_{9.2})_{\propto}Ti_{18-y}Al_yO_{54}$ (y=0.8, ∝=1+y/36, x=0.6)	1440	Orthorhombic Tungsten Bronze	72.1	4600		−42	1484
3586	(1-x)$CaTiO_3$-xSm$(Mg_{1/2}Ti_{1/2})O_3$ (x=0.2)		Orthorhombic Pnma	72.0	12000		160	1008
3587	$Pb_{0.5}Ca_{0.5}(Ni_{1/3}Nb_{2/3})O_3$		Perovskite	73.0	5100	3.5	52	996
3588	$Pb_{0.4}Ca_{0.6}(Mg_{1/3}Nb_{2/3})O_3$		Perovskite	73.0	4100	3.1	3.7	996
3589	Ba_{6-3x} $Sm_{8+2x}Ti_{18}O_{54}$ (x=2/3)+0.5 wt% $(71ZnO$- $29B_2O_3)$	1200	Tungsten-Bronze Orthorhombic	73.0	4830	–	−14	1475
3590	$(Pb_{0.5}Ni_{0.5})(Mg_{1/3}Nb_{2/3})O_3$		Perovskite	73.0	4900		52	996
3591	Ba_{6-3x} $Sm_{8+2x}Ti_{18}O_{54}$ (x=2/3)+0.5 wt% $(40$ B_2O_3- $60SiO_2)$	1200	Tungsten-Bronze Orthorhombic	73.0	7900	–	−16	1475
3592	$Ba_{6-3x}Sm_{8+2x}Ti_{18}O_{54}$ (x=2/3)+0.5 wt% B_2O_3	1220	Tungsten Bronze Orthorhombic	73.0	9500	–	−14	1475
3593	$Ba_{0.98}Sr_{0.02})Sm_2Ti_4O_{12}$	1375/6	Tungsten Bronze	73.0	7920		−6	1509

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
3594	$Ca_4La_2Ti_5O_{17}$	1550/4h	Cubic perovskite	73.0	16000	3.3	127	1118, 1510
3595	$Ba_3LiNb_{3-x}Ta_xTi_5O_{21}$ (x=1)			73.0	13600		172	1443
3596	$Ba_{6-3x}Nd_{8+2x}Ti_{18}O_{54}$ (x=2/3)+2 wt% H_3BO_3-TEOS	1075	Tungsten-Bronze Orthorhombic	73.8	8200		47	1511
3597	$Ba_4Nd_{3.33}Eu_6Ti_{18}O_{54}$	1460	Tungsten-Bronze	73.9	8900		−11	1512
3598	$Ca_{0.8}Sr_{0.2}TiO_3$-$Li_{0.5}Sm_{0.5}TiO_3$+x wt%[YB_2O_3-(1-y)CuO] (x=7.5, y=0.5)	950		74.0	2500		1	1513
3599	$BaTi_{0.95}Co_{0.05}O_{3-\delta}$	1450/2h	Perovskite	74.0	1300			1446
3600	$Pb_{0.5}Ca_{0.5}ZrO_3$	1500	Perovskite	74.0	3900	3.7	−17	1514
3601	$Ba_{6-3x}Sm_{8+2x}Ti_{18}O_{54}$ (x=2/3)+0.5 wt% (50ZnO- 50B_2O_3)	1220	Tungsten bronze	74.0	5330	–	−17	1475
3602	$Ba_{6-3x}Sm_{8+2x}Ti_{18}O_{54}$ (x=2/3)+0.5 wt% (30 BaO- 40B_2O_3+-30SiO_2)	1220	Tungsten Bronze Orthorhombic	74.0	9700	–	−12	1475
3603	TiO_2+zinc borosilcate glass	900	Composite	74.0	8000		340	1515
3604	0.88TiO_2-0.12$Bi_2Ti_4O_{11}$	1200	composite	74.0	9500		3	1372
3605	BaO-Sm_2O_3-TiO_2		Tungsten Bronze	74.0	12000		10	1516
3606	$BaTi_{0.92}Ga_{0.08}O_{2.96}$	1450	Tetragonal Perovskite	74.0	7810	5.5		1517
3607	0.7$Ca_{0.6}La_{0.267}TiO_3$-0.3$Ca(Sm_{0.5}Nb_{0.5})O_3$		Perovskite	74.3	12700		9	1518
3608	$Ba_4(Sm_{0.5}Nd_{0.5})_{28/3}Ti_{18+x}O_{54}-2TiO_2$+2 2x+1.5 wt% Al_2O_3	1260/5h	Mixture	74.3	11900		5	1519
3609	$Ba_{(2-x)}Sm_{(4+2/3x)}Ti_9O_{28}$ (x=0.2)	1370		74.8	10900	5.78	2	1501
3610	$Ca_2Ba_3Nb_2TiO_{12}$	1500	Cubic perovskite	75.0	1600	3.04	53	1307
3611	Ba_{6-3x} $Sm_{8+2x}Ti_{18}O_{54}$ (x=2/3)+0.5 wt% (40PbO-40B_2O_3-20SiO_2)	1200	Tungsten-Bronze Orthorhombic	75.0	6500	–	−17	1475
3612	$(Pb_{0.5}Co_{0.5})(Mg_{1/3}Nb_{2/3})O_3$		Perovskite	75.0	1400		16	996
3613	$(Bi_{1.92}Zn_{0.08})(Zn_{0.64}Nb_{1.36})O_7$	1000	Pyrochlore-Monoclinic	75.0	1800			1520
3614	$Ba_{.98}Sr_{0.02.2}Sm_2Ti_4O_{12}$		Tungsten Bronze	75.0	7920		−6	1509
3615	$Pb_{0.5}Ca_{0.5}(Co_{1/3}Nb_{2/3})O_3$		Perovskite	75.0	1450	3.7	16	996
3616	$Li_{1/2}Nd_{1/2}TiO_3$		Perovskite	75.0	2000		−274	1498

3617	$0.6(Sm_{1/2}Li_{1/2})TiO_3$-$0.4(Sm_{1/2}Na_{1/2}Ti)O_3$	1350		75.0	2000	10		1521
3618	$Ni_{0.15}Nb_{0.3}Ti_{0.55}O_2$	1080	Tetragonal rutile	75.0	12800		280	1522
3619	$xBi_{2/3}MoO_4$-1-x $BiVO_4$ (x=0.5-0.7)	850	Monoclinic/Tetragonal phase boundary	75	8000			1523
3620	$Ba_4Sm_{9.33}Ti_{18}O_{54}$+0.5 wt% GeO_2	1200	Tungsten-Bronze Orthorhombic	75.2	5200		−12	1524
3621	$BaSm_2Ti_4O_{12}$+1 wt% CuO	1160	Tungsten Bronze	75.8	4900		−8	1525
3622	$Ba_{6-3x}(Sm_{1-y}Nd_y)_{8+2x}Ti_{1-z}Sn_z)_{18}O_{54}$ (x=2/3, y=0, z=0.05)		Tungsten Bronze	76.0	6260	4.1	2	1526
3623	$Ba_{6-3x}Sm_{8+2x}Ti_{18}O_{54}$ (x=2/3)+0.5 wt% ($30BaO$-$40B_2O_3$-$30SiO_2$)	1220	Tungsten Bronze Orthorhombic	76.0	9100	–	−7	1475
3624	$Ba_{6-3x}(Sm_{1-y}Nd_y)_{8+2x}Ti_{1-z}Sn_z)_{18}O_{54}$ (x=2/3, y=0.1, z=0.05)		Tungsten-Bronze Orthorhombic	76.0	7130	4.2	6	1526
3625	$(Bi_{1.92}Ca_{0.08})(Zn_{0.64}Nb_{1.36})O_7$	960	Pyrochlore-Monoclinic	76.0	3900			1520
3626	$(Bi_{1.92}Cd_{08})(Zn_{0.64}Nb_{1.36})O_7$	980	Pyrochlore-Monoclinic	76.0	700			1526
3627	$Ba_4Sm_{9.33}Ti_{18}O_{54}$	1350	Tungsten-Bronze Orthorhombic	76.0	10000		−12	1475
3628	$Y_2Ti_2O_7$+8 wt% Bi_2O_3-+1 mol% Nd_2O_3-Nb_2O_5	1350	composite	76.0	18950		26	1527
3629	$Ba_{6-3x}(Sm_{1-y}Nd_y)_{8+2x}(Ti_{1-z}Sn_z)O_{54}$ (x=2/3, y=0, z=0.05)		Tungsten-Bronze Orthorhombic	76.0	6260		2	1526
3630	$Bi_3(Nb_{0.8}V_{0.2})O_7$	870	cubic	76.0	460		3	1528
3631	$Ba_4Sm_{9.33}Ti_{18}O_{54}$+0.5 wt% B_2O_3	1200	Tungsten-Bronze Orthorhombic	76.1	10500		−19	1524
3632	$Ba_{4.5}Gd_9Ti_{18}O_{54}$		Tungsten Bronze	76.1	2050		−35	1529
3633	$Sr_4Ti_3O_{10}(Sr_{n+1}Ti_nO_{3n+1})$		Perovskite Tetragonal I4/mmm	76.1	12700	2.2	576	1358
3634	$Ba_{(2-x)}Sm_{(4+2/3x)}Ti_9O_{24}$ (x=0.15)	1370		76.1	12800	5.2	1	1501
3635	$(Ba_{4.2}Sm_{9.2})_\propto Ti_{18-y}Al_yO_{54}$ (y=0.4, ∝=1+y/36, x=0.6)	1440	Tungsten bronze	76.1	3800		−33	1484
3636	$Bi_2(Zn_{1/3}Nb_{2/3})_2O_7$	950/2h	Monoclinic Pyrochlore	76.2	2980		200	1530
3637	$Li_{1+x-y}Nb_{1-x-y}Ti_{x+4y}O_3$ (x=0.15, y=0)	1100/1h	M -Phase	76.2	1000	5.3	−62	1400, 1438
3638	$Ba_4(Nd_{0.7}Sm_{0.3})_{9.33}Ti_{18}O_{54}$+2 wt% BBS	1000	Tungsten-Bronze Orthorhombic	76.3	8300		18	1531
3639	$Ba_4Sm_{7.33}Eu_2Ti_{18}O_{54}$	1460	Tungsten Bronze	76.4	8990		−16	1512
3640	$Ba_4Nd_{1.33}Eu_8Ti_{18}O_{54}$	1400	Tungsten Bronze	76.6	8590		−21	1512

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
3641	$Ba(Mg_{0.167}Ta_{0.33}Ti_{0.50})O_3$	1550	Perovskite	76.6	10000	4.1	113	883
3642	$Ba_4(Nd_{0.7}Sm_{0.3})_{9.33}Ti_{18}O_{54}$+1 wt% BBS glass	1100	Tungsten-Bronze Orthorhombic	76.6	8200		13	1531
3643	$Bi_2(Zn_{1/3}Nb_{2/3-x}V_x)_2O_7$ (x=0.001))	990	Pyrochlore Monoclinic	76.7	3580		−88	1532
3644	$0.91BiVO_4$–$0.09Li_{0.5}La_{0.5}WO_4$	750	Monoclinic	76.7	6800		7	1506
3645	$Ba_{4.2}Sm_{9.2}Ti_{18}O_{54}$+0.2 wt% Al_2O_3	1340/3h	Tungsten-Bronze	76.9	10100		−23	1533
3646	$Ba_4Eu_{9.33}Ti_{18}O_{54}$	1400	Tungsten-Bronze Orthorhombic	77.0	6580		34	1512
3647	$Ba_{6-3x}(Sm_{1-y}Nd_y)_{8+2x}Ti_{1-z}Sn_z)_{18}O_{54}$ (x=2/3, y=0.3, z=0.05)		Tungsten Bronze	77.0	7850	4.2	9	1526
3648	$(Ti_{0.9}Zr_{0.1})O_2$	1400/5h	Rutile Tetragonal $P4_2/mmm$	77.0	14000	4		53
3649	24 wt% $BaTiO_3$-76 wt% Nd_2O_3-$3TiO_2$	1220	composite	77.0	11000		123	1534
3650	$(Ba_{1-\alpha}Sm_\alpha)_{4.2}Sm_{9.2}Ti_{18}O_{54}$ α=0.1	1450/2h	Tungsten-Bronze Orthorhombic	77.0	6680		−11	1535
3651	$BaSm_2Ti_5O_{14}$		Tungsten Bronze Orthorhombic Pbam	77.0	9300		12	1536, 1537
3652	$Ba_{6-3x}(Sm_{1-y}Nd_y)_{8+2x}(Ti_{1-z}Sn_z)O_{54}$ (x=2/3, y=0.3, z=0.05)	1360/12	Tungsten-Bronze Orthorhombic Pbam	77.0	8185	4	1	1536
3653	$Ba_4Sm_{9.33}Ti_{18}O_{54}$+0.5 wt% GeO_2	950	Tungsten-Bronze Orthorhombic Pbam	77.3	8900		−19	1524
3654	$Na_{0.5x}Bi_{1-0.5x})(Mo_xV_{1-x})O_4$ (x=0.05)	720		77.3	8000	3.8	20	1538
3655	Ba_{6-3x} $Sm_{8+2x}Ti_{18}O_{54}$+0.5 wt% GeO_2+0.5 wt% B_2O_3 (x=2/3)	1150	Tungsten-Bronze Orthorhombic Pbam	77.3	8900		−13	1524
3656	$Ba_{(2-x)}Sm_{(4+2/3x)}Ti_9O_{24}$ (x=0)	1360		77.5	11200	5.2	−3	1501
3657	$Li_{1+x-y}Nb_{1-x-y}Ti_{x+4y}O_3$ (x=0.05, y=0.05)	1100/1h	M -Phase	77.8	2180	5.2	−42	1400, 1438
3658	$Ba_4Nd_{5.33}Eu_4Ti_{18}O_{54}$	1460	Tungsten-Bronze Orthorhombic Pbam	78.0	10460		10	1512
3659	$(Ba_{4.2}Sm_{.9.2})_aTi_{17.8}Al_{.0.2}O_{54}$	1460	Tungsten-Bronze Orthorhombic	78.0	8233	4.8	−18	1484
3660	$Pb_{0.5}Ca_{0\cdot5}(Li_{1/4}Nb_{3/4})O_3$		Perovskite	78.0	2000	3.7	460	996
3661	$Pb_{0.4}Ca_{0.6}[(Fe_{1/2}Nb_{1/2})_{0.95}Sn_{0.05}O_3$	1150/3h	Perovskite Orthorhombic	78.0	6000		−9	1497
3662	$Ca(Zr_{0.6}Ti_{0.4})O_3$		Perovskite Orthorhombic	78.0	7840			906
3663	$(Ni_{1/3}Nb_{2/3})_{1-x}Ti_xO_2$ (x=0.4)	1200	Rutile Tetragonal $P4_2/mmm$	78.0	17060		98	1276

3664	$Ba_3LiNb_3Ti_5O_{21}$	1100	Hexagonal $P6_3/mcm$	78.0	9800		205	1443
3665	$(Ba_{4.2}Sm_{9.2})_{\propto}Ti_{18-y}Al_yO_{54}$ (y=0.2, $\propto$=1+y/36, x=0.6)	1460	Tungsten-Bronze Orthorhombic Pbam	78.0	8200		−18	1484
3666	$K_{0.5x}Bi_{1-0.5x}(Mo_xV_{1-x})O_4$ (x=0.8-0.1)	700	Scheelite Tetragonal	78.0	7800			1539
3667	$Ba_4(Nd_{28/3-y}Yb_y)Ti_{18}O_{54}$ (y=1)	1480/2h	Tungsten-Bronze Orthorhombic	78.4	6780		53	1542
3668	$Ba_{(2-x)}Sm_{(4+2/3x)}Ti_9O_{24}$ (x=0.05)	1360		78.5	11900	5.2	−2	1501
3669	$Bi_2(Zn_{1/3}Nb_{2/3-x}V_x)_2O_7$ (x=0.001)	850/2	Pyrochlore Monoclinic	78.5	3780			1530
3670	$Ba_4Nd_{8.33}DyTi_{18}O_{54}$	1480	Orthorhombic Pbam	78.6	10040	4.8	34	1537
3671	$Ba_{6-3x}Sm_{8+2x}Ti_{18}O_{54}$ (x=0.75)		Orthorhombic Pbam	78.6	8700		–	1536
3672	$Bi_2(Zn_{1/3}Nb_{2/3-x}V_x)_2O_7$ (x=0.003)	850/2	Pyrochlore monoclinic	78.6	3140			1530
3673	$Ba_4Sm_{8.33}EuTi_{18}O_{54}$	1460	Tungsten-Bronze Orthorhombic Pbam	78.7	9560		−11	1512
3674	$Ba_4Sm_{9.33}Ti_{18}O_{54}$+0.3 mol% TiO_2	1350	Tungsten Bronze Pbam	78.8	10750	4.8	−21	1508
3675	(1-x)$Ca_{0.61}Nd_{0.26}TiO_3$-xNd$(Zn_{0.5}Ti_{0.5})O_3$+x=0.15		Perovskite	78.8	19200		134	1505
3676	$Ba_{6-3x}Sm_{8+2x}Ti_{18}O_{54}$ (x=0.5)		Tungsten-Bronze Orthorhombic Pbam	78.9	8400		−19	1536, 1540
3677	$Pb_{0.5}Ca_{0.5}(Na_{1/4}Nb_{3/4})O_3$		Perovskite	79.0	400	3.7	550	996
3678	$(Ba_{0.97}Ca_{0.03})$-Sm_2O_3-4.5TiO_2		Tungsten Bronze	79.0	10500	10	−5	1536
3679	$Bi_{18}(Ca_{1-x}Zn_x)_8Nb_{12}O_{65}$ (x=0.725)	925		79.0	1000	3.2	1	1452
3680	Bi_3NbO_7+20 wt% $Bi_4B_2O_9$	900	Composite	79.0	1000		8	1541
3681	$Ba_4Nd_{8.33}HoTi_{18}O_{54}$	1480	Tungsten-Bronze Orthorhombic Pbam	79.3	9690	4.7	31	1542
3682	$Ba_4Nd_{8.33}ErTi_{18}O_{54}$	1480	Tungsten-Bronze Orthorhombic	79.5	8290	4.1	53	1542
3683	$Ba_4Nd_{8.33}YbTi_{18}O_{54}$	1480	Tungsten-Bronze Orthorhombic Pbam	79.4	6780	4.7	33	1542
3684	$Ba_{6-3x}La_{8+2x}Ti_{1-z}Zr_x)_{18}O_{54}$ (x=2/3, z=0.1)		Tungsten-Bronze Orthorhombic	79.6	6670	4.83	109	1543
3685	$Ba_{6-3x}Sm_{8+2x}Ti_{18}O_{54}$ (x=2/3)+1 wt% Bi_2O_3 and $Ba_xSr_{1-x}TiO_3$		Tungsten-Bronze Orthorhombic	79.6	10800		2	1544
3686	$Ca_{(1-x)}Nd_{2x/3}TiO_3$ (x=0.3)		Perovskite	79.7	13000		295	1545
3687	Ba_{6-3x} $Sm_{8+2x}Ti_{18}O_{54}$-0.1TiO_2 (x=2/3)	1350/2h	Tungsten-Bronze Orthorhombic	79.8	9880		−18	1508
3688	Bi_3NbO_7		Cubic Fm3m	80.0	300	5		1546

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
3689	$Ba_4Sm_{9.33}Ti_{18}O_{54}$	1450	Tungsten Bronze	80.0	10700	4.7	−15	1524
3690	$91.9TiO_2$-$8.1Bi_2O_3$		Mixture phases	80.0	9000		21	1434
3691	$0.58(Sm_{1/2}Li_{1/2})TiO_3$-$0.42(Sm_{1/2}Na_{1/2}Ti)O_3$	1350	Tetragonal	80.0	2000	10		1521
3692	$0.8Bi_2O_3$-$0.3Nb_2O_5$	920/3h	Flourite δ-Bi_2O_3 Fm-3m	80.0	420		−306	1396
3693	$(Ti_{0.9}Ge_{0.1})O_2$	1400/5h	Rutile Tetragonal $P4_2/mmm$	80.0	24000	4		53
3694	$(Sm_{1/2}Na_{1/2}Ti)O_3$	1350	Perovskite Tetragonal I4/mmm	80.0	13000	10		1521
3695	$(La_{0.44}Sr_{0.33})TiO_3$	1350	Orthorhombic Ibmm	80.0	7500	3	70	1547
3696	$(Li_{1/2}Nd_{1/2})TiO_3$		Perovskite Orthorhombic	80.0	3100	4	−310	1548
3697	$0.15(Ba_{0.95}Sr_{0.05})$-$0.15Sm_2O_3$-$0.7TiO_2$	1380		80.0	11000	3	0	1549
3698	$Pb_{0.4}Ca_{0\cdot6}(Fe_{1/2}Nb_{1/2})O_3$		Perovskite	80.0	6100	3.2	−25	996
3699	$Ba_{6-3x}(Sm_{1-y}Nd_y)_{8+2x}Ti_{18}O_{54}$ (x=2/3, y=0.1)	1340/6h	Tungsten-Bronze Orthorhombic	80.0	9620	3.75		1550
3700	$Ba_{6-3x}(Sm_{1-y}Nd_y)_{8+2x}(Ti_{1-z}Sn_z)O_{54}$ (x=2/3, y=0.8, z=0.05)	1360/12	Tungsten-Bronze Orthorhombic Pbam	80.0	10600	3.9	11	1526
3701	$Ba_{6-3x}(Sm_{1-y}Nd_y)_{8+2x}(Ti_{1-z}Sn_z)O_{54}$ (x=2/3, y=0.5, z=0.05)	1360/12	Tungsten-Bronze Orthorhombic	80.0	10050	4	5	1526
3702	BaO-Bi_2O_3-Nd_2O_3-TiO_2+0.4 wt% $Mn(CH_3COO)_2$+WO_3	1320		80.0	7000		0	1551
3703	$(Ba_{1-\alpha}Sr_\alpha)_{4.2}Sm_{9.2}Ti_{18}O_{54}$ (α=0.01)	1450/2h	Tungsten-Bronze Orthorhombic	80.0	8890		−11	1535
3704	$(Ba_{1-\alpha}Sr_\alpha)_{6-3x}$ $Sm_{8+2x}Ti_{18}O_{54}$ (α=0.06, x=0.6)		Tungsten-Bronze Orthorhombic	80.0	10075		−7	1535
3705	$Bi_3(Nb_{0.9}V_{0.1})O_7$	870	Tetragonal	80	600		−22	1528
3706	$(Pb_{1-x}Ca_x)ZrO_3$		Perovskite	80-120	2000-4000		–	1460
3707	$Sr(Bi_{1-x}Nd_x)_8Ti_7O_{27}$	1250		80-120	120-2100		–	1552
3708	$(Ba_{0.952}Sr_{.0.048})_{4.2}Sm_{9.2}Ti_{18}O_{54}$		Tungsten-Bronze Orthorhombic Pbam	80.1	10205	4.9	−9	1535
3709	$(Ba_{1-\alpha}Sr_\alpha)_{4.2}Sm_{9.2}Ti_{18}O_{54}$ (α=0.06)	1450/2h	Tungsten-Bronze Orthorhombic Pbam	80.2	10075		−7	1535

3710	$(Ba_{1-\alpha}Sr_{\alpha})_{4.2}Sm_{9.2}Ti_{18}O_{54}$ (α=0.0)	1450/2h	Tungsten-Bronze Orthorhombic Pbam	80.3	9500		−9	1535
3711	$Ca_{0.8}Sr_{0.2}TiO_3$-$Li_{0.5}Sm_{0.5}TiO_3$+x wt% [YB_2O_3-(1-y)CuO] (x=7.5, y=0.5)	900	Perovskite	80.4	3000		–	1513
3712	$(Ba_{1-\alpha}Sr_{\alpha})_{4.2}Sm_{9.2}Ti_{18}O_{54}$ (α=0.04)	1450/2h	Tungsten Bronze	80.6	9590		−12	1535
3713	$Ba_{4.2}Nd_{9.2}Ti_{18-x}Sn_xO_{54}$ (x=0.5)	1340/2h	Tungsten Bronze	80.6	9200		61	1553
3714	$Ba_{6-3x}Sm_{8+2x}Ti_{18}O_{54}$ (x=2/3)	1360/3h	Tungsten-Bronze Orthorhombic	80.8	11330	4	−11	1508, 1554, 1555
3715	$Ba_{6-3x}(Sm_{0.2}Nd_{0.8})_{8+2x}Ti_{18}O_{54}$ (x=2/3)	1330/3h	Tungsten Bronze	80.8	8100		36	1556
3716	BaO-Pr_6O_{11}-TiO_2		Tungsten Bronze	81.0	9000	5	130	1516
3717	$(Ba_{1-x}Ca_x)O$-Sm_2O_3-4.5TiO_2 (x=0.05)		Tungsten Bronze	81.0	9500		2	1557
3718	$Pb_{1-x}Ca_x[(Fe_{1/2}Nb_{1/2})_{1-y}Sn_y]O_3$ (x=0.6, y=0.05)	1150/3h	Perovskite	81.0	4830		3	1497
3719	Bi_2O_3-TiO_2 (1:11.3)+0.112 wt% CuO	915/2h		81.0	8900		0	1558
3720	$Ba_{6-3x}(Sm_{1-y}Nd_y)_{8+2x}Ti_{18}O_{54}$ (x=2/3, y=0.3)	1340/12h	Tungsten Bronze	81.0	9630	3.9		1550
3721	$[(Li_{0.5}Bi_{0.5})xBi_x][Mo_xV_{1-x}]O_4$ (x=0.098)	650	Monoclinic sheelite	81.0	8000		10	1559
3722	$Ba_{3.75}Nd_{9.5}Ti_{17}(Mg_{1/3}Nb_{2/3})O_{54}$	1350/2h	Tugsten Bronze	81.0	7300		17	1560
3723	$Ba_4(Nd_{0.7}Sm_{0.3})_{9.33}Ti_{18}O_{54}$+0.5 wt% Ag	1100	Tungsten Bronze	81.1	11000	4.6	3	1531
3724	$Ba_4Sm_{5.33}Eu_4Ti_{18}O_{54}$	1460	Tungsten Bronze Orthorhombic	81.1	7109		−20	1512
3725	$Ba_4Nd_{7.33}Eu_2Ti_{18}O_{54}$	1460	Tungsten Bronze Orthorhombic	81.1	10660		31	1512
3726	$Ba_4Sm_{3.33}Eu_6Ti_{18}O_{54}$	1400	Tungsten Bronze Orthorhombic	81.2	8604		−26	1512
3727	$Ba_{4.2}Sm_{9.2}Ti_{18}O_{54}$+4 wt% $SrTiO_3$	1360/2h	Tungsten Bronze Orthorhombic	81.2	8470		−2	1561
3728	$Ba_4(Nd_{0.7}Sm_{0.3})_{9.33}Ti_{18}O_{54}$+1 wt% Ag	1100	Tungsten Bronze Orthorhombic	81.2	11000	4.84	1	1531
3729	$Ba_4Sm_{9.33}Ti_{18}O_{54}$(SPS)	1200/ 5mn	Tungsten Bronze	81.2	10099	5	−17	1562
3730	$(Ba_{098}Sr_{.0.02})_{4.2}Sm_{9.2}Ti_{18}O_{54}$		Tungsten Bronze Orthorhombic	81.4	9661	4.8	−11	1535
3731	$Ba_4Sm_{9.33}Ti_{18}O_{54}$+14 mol% TiO_2	1350	Composite	81.5	10415	5	0	1508
3732	Ba_{6-3x} $Sm_{8+2x}Ti_{18}O_{54}$-0.1TiO_2-1.4TiO_2 (x=2/3)	1350/2h	Tungsten Bronze	81.5	10400		0	1508

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
3733	$Ba_{6-3x}(Sm_{1-y}Nd_y)_{8+2x}Ti_{18}O_{54}$ (x=2/3, y=0.84)	1400/10h	Tungsten Bronze orthorhombic	81.7	10500		2	1563
3734	$LiNb_{0.6}Ti_{0.5}O_3$ textured			81.8	5750		−43	1563b
3735	$(Li_{1/2}Nd_{1/2})TiO_3$		Pervskite Tetragonal	82.0	2220		292	1564
3736	$Ba_{6-x}Sm_{8+2x}Ti_{18}O_{54}$ (x=0.5)	1300	Tungsten bronze	82.0	10150		−17	1563
3737	$(Pb_{0.45}Ca_{0.55})[(Fe_{0.5}(Nb_{.96}Ta_{0.04})_{0.5})O_3$	1150/3h	Perovskite cubic Pm3m	82.0	7650		−5	1565
3738	$Ba_{6-3x}(Sm_{1-y}Nd_y)_{8+2x}Ti_{18}O_{54}$ (x=2/3, y=0.5)	1340/16h	Tungsten Bronze orthorhombic	82.0	9500	3.75		1550
3739	$(Ba_{0.8}Ca_{0.2})_{6-3x}Sm_{8+2x}Ti_{18}O_{54}$ (x=1.5)	1350	Tungsten Bronze orthorhombic	82.0	10000		−20	1566
3740	$Ba_{6-3x}(Sm_{1-y}Nd_y)_{8+2x}Ti_{1-z}Sn_z)_{18}O_{54}$ (x=2/3, y=0.8, z=0.05)	1360/3h	Tungsten Bronze orthorhombic	82.0	1000	4.1	17	1526
3741	$Ba_4Sm_{8.08}Li_{0.25}Ti_{18}O_{54}$	1400	Tungsten Bronze orthorhombic	82.1	5620	4.7	−2	1567
3742	$Ba\{Ti_{0.95}Fe_{0\cdot.05}\}O_{3-d}$	1450	Perovskite	82.1	4800	4		1446
3743	$Ba_{6-3x}(Sm_{0.2}Nd_{0.8})_{8+2x}Ti_{18}O_{54}$ (x=2/3)+1 wt% Bi_2O_3	1200/3h	Tungsten Bronze orthorhombic	82.1	8530		17	1556
3744	$Ba_4La_4Ti_7O_{24}$		Hexagonal	82.2	500		317	1473
3745	$Ba_{6-3x}[Nd_{(8+2x)-y}Bi_y)_]Ti_{18}O_{54}$ (x=2/3, y=0.05)	1380	Tungsten bronze	82.2	9760		62	1519
3746	$(Ba_{0.8}Sr_{0.2})_{4.2}Sm_{9.2}Ti_{18}O_{54}$		Tungsten Bronze orthorhombic	82.3	2860		0	1535
3747	$Ba_4(Sm_{.95}Bi_{.05})_{9+1/3}Ti_{18}O_{54}$	1420	Tungsten Bronze orthorhombic	82.3	8810		−17	1568
3748	$Ba_{6-3x}Sm_{8+2x}Ti_{18}O_{54}$ (x=0.6)	1450	Tungsten Bronze orthorhombic	82.5	10500	4.6	−12	1554
3749	$Ba_4Nd_{9.33}Ti_{18}O_{54}$	1460	Tungsten bronze	82.5	10060		71	1516
3750	$(Pb_{1-x}Ca_x)[Fe_{1/2}Nb_{1/2}]_{1-y}Zr_y]O_3$ (y=0.01, x=0.55)	1150	Perovskite	82.5	6800	3.8	−3	1488
3751	$Ba_4Nd_{8.33}EuTi_{18}O_{54}$	1480	Tungsten Bronze orthorhombic	82.6	10400	4.8	47	1542
3752	$Ba_{6-3x}(Sm_{1-y}Nd_y)_{8+2x}Ti_{18}O_{54}$ (x=2/3, y=0.72)	1400/10h	Tungsten Bronze orthorhombic	82.7	10500		4	1563
3753	$Ba_{4.2}Sm_{9.2}Ti_{18}O_{54}$	1500	Tungsten Bronze orthorhombic	83.0	8950	3.5	−13	1569
3754	$BaO\text{-}Nd_2O_3\text{-}5TiO_2$	1450/2h	Tungsten bronze	83.0	10500		70	1516
3755	$Ba_{4.2}(Sm_{0\cdot.9}Nd_{0\cdot.1})_{9.2}Ti_{18}O_{54}$	1500	Tungsten Bronze orthorhombic	83.0	8936	3.5	−6	1569
3756	$CaBa_4Nb_2TiO_{12}$	1470	Cubic perovskite	83.0	1200	2.9	60	1307

3757	$(Pb_{0.45}Ca_{0.55})[(Fe_{0.5}Nb_{0.5})_{0.9}Sn_{0.1}]O_3$+ 0.2 wt% CuO+0.1 wt% Bi_2O_3	1000/3h	Tungsten Bronze	83.0	6080		8	1570
3758	$(Ni_{1/3}Nb_{2/3})_{1-x}Ti_xO_2$ (x=0.5)	1200	Rutile Tetragonal $P4_2/mmm$	83.1	19300		165	1276
3759	$Ba_{6-3x}(Sm_{1-y}Nd_y)_{8+2x}Ti_{18}O_{54}$ (x=2/3, y=0.6)	1400/10h	Tungsten Bronze Orthorhombic	83.4	10700	4	11	1550
3760	$Ba\{Ti_{0.92}Ga_{0.008}\}O_{3-\delta}$	1450	Perovskite Hexagonal	83.7	4200	4.2		1446
3761	$Ba_{6-3x}(La_{1-y-z}Sm_yBi_z)_{8+2x}Ti_{18}O_{54}$ (x=2/3, y=0.7, z=0)	1350/3h	Tungsten Bronze	83.8	8000	4.0	33	1571
3762	$(Pb_{1/2}Ca_{1/2})(Fe_{1/2}Ta_{1/2})O_3$	1250/ 30 min	Perovskite Cubic	83.9	6680	7		1572
3763	$Ba_4(Nd_{.95}Bi_{.05})_{9.33}Ti_{18}O_{54}$	1360	Tungsten Bronze Orthorhombic	83.9	8330		32	1568
3764	$Ba_{4.2}(Sm_{0.9}La_{0.1})_{9.2}Ti_{18}O_{54}$	1500	Tungsten Bronze Orthorhombic	84.0	9050	3.5	2	1569
3765	Ba_{6-3x} $(Sm_{1-y}Nd_y)_{8+2x}Ti_{18}O_{54}$ (x=0.6, y=0.2)	1500/2h	Tungsten Bronze	84.0	9000		0	1569
3766	$BaO.(Nd_{0.8}Bi_{0.2})_2O_3.4TiO_2$+$Bi_2O_3$-$B_2O_3$-ZnO-$SiO_2$			84.0	3000		24	1573
3767	$Ba_{6-3x}Sm_{8+2x}Ti_{18}O_{54}$ (x=0.7) hotpressed	1200	Tungsten Bronze Orthorhombic	84.0	9960		−14	1574
3768	$0.95TiO_2$-$0.05Bi_2Ti_4O_{11}$	1200		84.0	12500		230	1372
3769	$BaPr_2Ti_5O_{14}$		Tungsten Bronze Orthorhombic	84.0	9000	5	150	1575
3770	$(Ba_{0.9}Ca_{0.1})$-Sm_2O_3-$4.5TiO_2$		Tungsten bronze	84.0	9500	10	25	1557
3771	$Ba_4(Sm_{0.9}Bi_{0.1})_{9+1/3}Ti_{18}O_{54}$	1380	Tungsten Bronze Orthorhombic	84.1	7840		−21	1568
3772	$0.4PbZrO_3$-$0.6Ca(Fe_{1/2}Nb_{1/2})O_3$		Perovskite	84.7	3000	4.2	41	1576
3773	$Ba_{4.2}(Sm_{0.7}Nd_{0.3})_{9.2}Ti_{18}O_{54}$	1500	Tungsten Bronze Orthorhombic	85.0	9160	3.5	9	1569
3774	$Ba_{6-3x}(Sm_{1-y}Nd_y)_{8+2x}Ti_{18}O_{54}$ (x=2/3, y=0.8)	1340/12h	Tungsten Bronze Orthorhombic	85.0	9460	3.9	1	1550
3775	$0.77Bi_2O_3$-$0.23Nb_2O_5$	900/3h	Flourite δ-Bi_2O_3 Fm-3m	85.0	350		−215	1396
3776	$Pb_{1-x}Ca_x[(Fe_{1/2}Nb_{1/2})_{1-y}Sn_y]O_3$ (x=0.55, y=0.1)	1150/3h	Perovskite	85.0	8600		0	1497
3777	$(Pb_{1-x}Ca_x)[(Fe_{1/2}Nb_{1/2})_{1-y}Zr_y]O_3$ (y=0.1, x=0.55)	1200	Perovskite	85.0	8600		−1	1488
3778	$Bi_3Nb_{0.8}Ta_{0.2}O_7$	855/4h		85.0	800		24	1577
3779	$Pb_{0.45}Ca_{.0.55}[(Fe_{1/2}Nb_{1/2})_{0.9}Sn_{0.1}O_3$	1150/3h	Perovskite Orthorhombic	85.3	8600		0	1497

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
3780	$Ba_4Sm_{8.33}LiTi_{18}O_{54}$	1400	Tungsten Bronze orthorhombic	85.4	5045	4.5	45	1567
3781	$Ba_{4.2}(Sm_{0.5}Nd_{0.5})_{9.2}Ti_{18}O_{54}$	1500	Tungsten Bronze	86.0	9170	3.4	25	215
3782	$Pb_{0.5}Ca_{0\cdot5}(Mg_{1/3}Nb_{2/3})O_3$		Perovskite	86.0	4600	3.0	34	996
3783	$(Pb_{0.45}Ca_{0.55})[(Fe_{0.5}Nb0_{\cdot0.5})_{0.9}Sn_{0.1}]O_3$+ 0.2 wt% CuO+0.4 wt% Bi_2O_3	1000/3h	Perovskite Orthorhombic	86.0	4340		8	1578
3784	$0.74Bi_2O_3$-$0.26Nb_2O_5$	900/2h	Flourite δ-Bi_2O_3 Fm-3m	86.0	1000		120	1396
3785	$BaTi_{0.5}Ga_{0.25}Nb_{0.25}O_3$	1500/4h	Perovskite Tetragonal P4mm	86.0	3050	4		1373
3786	$Ba_{1.37}Na_{063}Nd_2TiO_{10}$	1250	Orthorhombic Amam	86.0	1500		270	1579
3787	$Ba_{6\text{-}3x}$ $Nd_{8+2x}Ti_{18}O_{54}$ (x=0.75)		Tungsten Bronze Orthorhombic	86.0	10450		–	1536
3788	$Ba_{6\text{-}3x}(Sm_{1\text{-}y}Nd_y)_{8+2x}Ti_{18}O_{54}$ (x=0.5, y=0.67)	1400/10h	Tungsten Bronze Orthorhombic	86.0	7850		234	1563
3789	$BaNd_2TiO_{12}$+0.075 wt% $Bi_4B_2O_9$	1200	Orthorhombic	86.0	5400		4	287
3790	BaO-Nd_2O_3-$4TiO_2$+10 wt% $Bi_4B_2O_9$		Tungsten Bronze	86.0	4700		1	1580
3791	$0.15(Ba_{0.93}Sr_{0.07})O$-$0.15(Sm_{0.4}La0.6)_2O_3$-$0.7TiO_2$]	1370		86.2	16700		95	1581
3792	$Pb_{0.45}Ca_{0.55}[(Fe_{1/2}Nb_{1/2})_{0.95}Sn_{0.05}O_3$	1150/3h	Perovskite Orthorhombic	86.3	6250		2	1497
3793	$(Pb_{1\text{-}x}Ca_x)[Fe_{1/2}Nb_{1/2}]_{1\text{-}y}Zr_y]O_3$ (y=0.01, x=0.5)	1150	Perovskite Orthorhombic	86.3	6800	3.7	25	1488
3794	$Pb_{0.45}Ca_{0.55}[(Fe_{1/2}Nb_{1/2})_{0.9}Sn_{0.1}$ O_3	1150/3h	Perovskite Orthorhombic	86.7	7900		0	1497
3795	$Ba_{6\text{-}3x\text{-}z}Sr_zNd_{8+2x\text{-}y}$ $Bi_yTi_{18}O_{54}$ (y=0, z=0.9, x=0.5)		Tungsten Bronze	86.7	7200		63	1582
3796	$Ba_{6\text{-}3x}(La_{1\text{-}y\text{-}z}Sm_yBi_z)_{8+2x}Ti_{18}O_{54}$ (x=2/3, y=0.5, z=0)	1350/3h	Tungsten Bronze Orthorhombic	86.9	7360	3.8	83	1571
3797	$0.9CaTiO_3$-$0.1Sm(Mg_{0.5}Ti_{0.5})O_3$	1550	Perovskite	87.0	9500	3.2	285	865
3798	$(Pb_{1\text{-}x}Ca_x)[(Fe_{1/2}Nb_{1/2})_{1\text{-}y}Zr_y]O_3$ (y=0.05, x=0.55)	1200	Perovskite Orthorhombic	87.0	8500		−10	1488
3799	$Sr(Bi_{1\text{-}x}Nd_x)_8Ti_7O_7$ (x=0.05)			87.0	190			1583
3800	$(Ba_{1\text{-}z}Pb_z)_{6\text{-}x}Nd_{8+2/3x}Ti_{18}O_{54}$ (x=2/3, z=0.4)	1400/2h	Tungsten Bronze Orthorhombic	87.0	4000		−32	1584
3801	$Ca_{(1\text{-}x)}Nd_{2x/3}TiO_3$ (x=0.39)		Perovskite	87.5	12400		242	1545
3802	$Pb_{0.46}Ca_{0.54}[(Fe_{1/2}Nb_{1/2})_{0.9}Sn_{0.1}$ O_3	1150/3h	Perovskite Orthorhombic	87.8	7870		5	1497

3803	$Ba_{4.2}(Sm_{0.1}Nd_{0.9})_{9.2}Ti_{18}O_{54}$	1500	Tungsten Bronze Orthorhombic	88.0	9500	3.44	64	1569
3804	$Ba_{6-x}Nd_{8+2x}Ti_{18}O_{54}$ (x=0.7) hot pressed	1300	Tungsten Bronze	88.0	4920		55	1574
3805	$Ba_{4.2}(Sm_{0.7}La_{0.3})_{9.2}Ti_{18}O_{54}$	1500	Tungsten Bronze Orthorhombic	88.0	8050	3.44	44	1569
3806	$Ba_{6-3x}(Sm_{1-y}Nd_y)_{8+2x}Ti_{18}O_{54}$ (x=0.6, y=0.9)	1500/2h	Tungsten Bronze Orthorhombic	88.0	8500		64	1569
3807	$Ba_{6-3x}(Sm_{1-y}Nd_y)_{8+2x}Ti_{18}O_{54}$ (x=0.6, y=1.0)	1500/2h	Tungsten Bronze Orthorhombic	88.0	8300		76	1569
3808	$BaO\text{-}Bi_2O_3\text{-}TiO_2\text{-}Nd_2O_3$		Tungsten Bronze	88.0	5500		8	1534
3809	$(Ba_{1-3z}Pb_z)_{6-x}Nd_{8+2/3x}Ti_{18}O_{54}$ (x=2/3, z=0.22)	1400/2h	Tungsten Bronze Orthorhombic	88.0	5500		0	1584
3810	$BaO\text{-}Nd_2O_3\text{-}4TiO_2$+0.5 wt% Al_2O_3+8 wt% Bi_2O_3		Tungsten Bronze	88.0	8000	–	0	1111
3811	$(1\text{-}x)(Mg_{0.95}Zn_{0.05})TiO_3\text{-}xCa_{0.6}La_{0.8/3}TiO_3$ (x=0.9)	1320/4h	Composite	88.0	32800		205	465
3812	$Ba_{4.2}Nd_{9.2}Ti_{18}O_{54}$	1500	Tungsten Bronze	88.0	8315	3.4	76	1566
3813	$Li_{0.2}Nd_{0.6}TiO_3$	1450		88.0	2400		−210	1585
3814	$Pb_{0.46}Ca_{0.54}[(Fe_{1/2}Nb_{1/2})_{0.95}Sn_{0.05}\ O_3$	1150/3h	Perovskite Orthorhombic	88.2	6100		7	1497
3815	$Ba_{6-3x}(La_{1-y-z}Sm_yBi_z)_{8+2x}Ti_{18}O_{54}$ (x=2/3, y=0.7, z=0.04)	1350/3h	Tungsten Bronze	88.4	6690	4.4	1	1571
3816	$0.05Pb(Fe_{2/3}W_{1/3})O_3\text{-}0.95Pb_{0.4}Ca_{0.6}(Fe_{1/2}Nb_{1/2})O_3$	1000	Perovskite	88.4	3800		−6	1480
3817	$Ba_4(Sm_{0.85}Bi_{0.15})_{9+1/3}Ti_{18}O_{54}$	1360	Tungsten Bronze Orthorhombic	88.9	6620		−20	1568
3818	$Ba(Nd_{0.82-z}Sm_zBi_{0.18})Ti_4O_{12}$ (z=0.7)	1300/2h	Tungsten Bronze	89.0	6880	4.5		1586
3819	$(Pb_{0.45}Ca_{0.55})[(Fe_{0.5}Nb_{0.5})_{0.9}Sn_{0.1}]O_3$+ 5 wt% BiO_3-LiF	950	Perovskite Orthorhombic	89.0	800		−15	1587
3820	$0.2CaTiO_3\text{-}0.5(Li_{1/2}Nd_{1/2})TiO_3\text{-}0.3(Dy_{1/3}Nd_{1/3})TiO_3$	1350/3h	Tetragonal P-4b2 Perovskite	89.4	4650		−87	1498
3821	$(Ni_{1/3}Nb_{2/3})_{1-x}Ti_xO_2$ (x=0.6)	1200	Rutile Tetragonal $P4_2/mmm$	89.4	12800		193	1276
3822	$Ba_{6-3x}(Nd_{1-y}Bi_y)_{8+2x}Ti_{18}O_{54}$ (x=2/3, y=0.04)	1340/3h	Tungsten Bronze Orthorhombic	89.6	7700	4.0	21	1588
3823	$Ba_{6-3x}Nd_{8+2x}Ti_{18}O_{54}$+$PbO/Bi_2O_3$		Tungsten Bronze	90.0	9000	–	0	1569
3824	$BaO\text{-}(Nd_{0.95}Bi_{0.05})_2O_3\text{-}4TiO_2$	1300	Tungsten Bronze type	90.0	7600		33	168

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
3825	$0.96La_{2/3}TiO_3$-$0.04CaTiO_3$		Perovskite Orthorhombic	90.0	27000	10	190	1589
3826	MBRT-90	1300/2h	Composite	90.0	6100		6	510
3827	$0.75Bi_2O_3$-$0.25Nb_2O_5$	900/3h	Flurite δ-Bi_2O_3 Fm-3m	90.0	630		60	1396
3828	$0.5Sm_{1/2}Li_{1/2}TiO_3$-$0.5Sm_{1/2}Na_{1/2}TiO_3$	1300	Tetragonal	90.0	1500		−140	1521
3829	$BaNd_2Ti_5O_{14}$+25 wt% Nd_2O_3+0.5 mol% PbO	1250/2h	Tungsten Bronze Orthorhombic	90.0	6000		−20	1590
3830	$Ca_{0.61}Nd_{0.26}TiO_3$ (Sol-gel)	1200	Orthorhomic perovskite Pmna	90.2	25200		243	1591
3831	$0.1La(Mg_{1/2}Ti_{1/2})O_3$-$0.9CaTiO_3$	1500	Perovskite Pbnm	90.4	31900	5.8	–	932
3832	$(Pb_{1-x}Ca_x)[Fe_{1/2}Nb_{1/2}]_{1-y}Zr_y]O_3$ (y=0.01,x=0.45)	1150	Perovskite	90.6	2500	3.6	41	1488
3833	$BaSm_{1.8}La_{.2}Ti_5O_{14}$		Orthorhombic Pbam	90.7	8900	–	4	1592
3834	$Ba_{6-3x}(Nd_{(8+2x)-y}Bi_y)Ti_{18}O_{54}$ (x=2/3, y=0.1)	1360	Tungsten Bronze Orthorhombic	90.7	7020		24	1568
3835	$(Pb_{0.5}Ca_{0.5})_{0.92}La_{0.08}(Fe_{0.5}Nb_{0.}5)O_3$	1190/ 2.5h	Perovskite	90.8	5800		15	1593
3836	$(Ca_{0.61}Nd_{0.26})(Ti_{0.98}Sn_{0.2})O_3$-$0.6(Li_{0.5}Nd_{0.5})TiO_3$+5 wt% H_3BO_3-CuO+0.5 wt% Li_2CO_3	900	Composite	90.8	3400		9	1594
3837	$Ba_{6-x}Sm_{8+2x}Ti_{18}O_{54}$ (x=0.5) hot pressed	1300	Tungsten Bronze Orthorhombic	91.0	10870		3	1574
3838	Bi_3NbO_7		Cubic flurite type Fm-3m	91.0	730		100	1595
3839	$(Pb_{0.5}Ca_{0.5})_{0.92}La_{0.08}(Fe_{0.5}Nb_{0.}5)O_3$+1 wt% Bi_2O_3-MnO_2	1050/4h	Perovskite+Pyrochlore	91.1	4870		19	1593
3840	$Ba_4Sm_{6.33}Li_3Ti_{18}O_{54}$	1400	Tungsten Bronze Orthorhombic	91.3	3990	4.4	111	1567
3841	$0.3Pb(Fe_{2/3}W_{1/3})O_3$-$0.7Pb_{0.2}Ca_{0.8}(Fe_{1/2}Nb_{1/2})O_3$	1000	Perovskite	91.3	1650		7	1480
3842	$(Li_{1/2}Pr_{1/2})TiO_3$		Perovskite	92.0	1010		403	1564
3843	$Ba_{4.5}Nd_9Ti_{18}O_{54}$+15mol% $Ba_{4.5}Gd_9Ti_{18}O_{54}$	1350/10h	Tungsten Bronze	92.0	5000		0	1596
3844	$0.75Bi_2O_3$-$0.25Nb_2O_5$	850/3h	Flourite δ-Bi_2O_3 Fm-3m	92.0	720		96	1396
3845	$(Ca_{0.3}Li_{0.14}Sm_{0.42})TiO_3$	1350	Perovskite Orthorhombic	92.1	8292		2.6	719

3846	$Ba_{6-3x}(Nd_{1-y}Bi_y)_{8+2x}Ti_{18}O_{54}$ (x=2/3, y=0.08)		Tungsten Bronze Orthorhombic	92.3	6460	4	10	1588
3847	$Ba_4Sm_{3.33}Li_6Ti_{18}O_{54}$	1350	Tungsten Bronze Orthorhombic	92.4	3580	4.4	303	1567
3848	$Ba_4(Sm_{0.8}Bi_{0.2})_{9+1/3}Ti_{18}O_{54}$	1360	Tungsten Bronze Orthorhombic	92.4	5680		−12	1568
3849	$Ca_{2/5}Sm_{2/5}TiO_3$-$Li_{1/2}Sm_{1/2}TiO_3$-0.8TiO_2	1300/2h		92.5	4900	4	9	1597
3850	$(Pb_{0.45}Ca_{0.55})(Fe_{0.5}Nb_{0.5})O_3$	1100/3h	Perovskite	92.6	5970			996
3851	$Ba_4Sm_{7.33}Li_2Ti_{18}O_{54}$	1400	Tungsten Bronze Orthorhombic	92.7	3720	4.4	89	1567
3852	$CaCu_{2.85}Mn_{0.15}Ti_4O_{12}$	1100	Cubic Im3m	93.0	3950	3.95	657	1598
3853	$Pb_{0.5}Ca_{0.5}$ $(Li_{1/4}Nb_{3/4})O_3$		Perovskite	93.0	2000	3.2	630	996
3854	$Ba_{4.2}(Sm_{0.5}La_{0.5})_{9.2}Ti_{18}O_{54}$	1500	Tungsten Bronze Orthorhombic	93.0	1300	3.3	118	1569
3855	$Ca_{1-x}Nd_{2x/3}TiO_3$ (x=0.42)	1400	Perovskite Orthorhombic	93.0	6940	7	228	1599
3856	0.95TiO_2-0.05$Bi_2Ti_4O_{11}$		Composite	93.0	12500		230	1372
3857	BaO-$(Nd_{1-x}Bi_x)_2O_3$-4TiO_2 (x=0.1)	1300	Tungsten Bronze	93.0	5900		15	168
3858	$Ba_{6-3x-z}Sr_zNd_{8+2x-y}$ $Bi_yTi_{18}O_{54}$ (y=0.5, x=0.5)		Tungsten Bronze Orthorhombic	93.4	5700		40	1582
3859	$(Pb_{0.48}Ca_{0.52})Fe_{1/2}Nb_{1/2})_{0.9}Sn_{0.1}O_3$	1150/3h	Perovskite Orthorhombic	93.6	7100		18	1600
3860	$Ba_4(Nd_{0.85}Bi_{0.15})_{9.33}Ti_{18}O_{54}$	1380	Tungsten Bronze Orthorhombic	93.7	6350		17	1568, 1601
3861	$(Pb_{0.48}Ca_{0.52})(Fe_{1/2}Nb_{1/2})O_3$+2.2 mol% CeO_2	119/2.5h	Perovskite	93.7	6770		2	1600
3862	$Ba_{6-3x}[Nd_{(8+2x)-y}Bi_y)]Ti_{18}O_{54}$ (x=2/3, y=0.15)	1360	Tungsten Bronze Orthorhombic	93.7	6350		17	1568
3863	$Ba_{6-3x}(La_{1-y-z}Sm_yBi_{0.04})_{8+2x}Ti_{18}O_{54}$ (x=2/3,y=0.5,	1340/3h	Tungsten Bronze Orthorhombic	93.9	4337	4	29	1571
3864	$Pb_{0.6}Ca_{0.4}ZrO_3$	1450	Perovskite	94.0	3600	3	−10	1514, 1602
3865	$Pb_{0.6}Ca_{0\cdot4}(Ni_{1/3}Nb_{2/3})O_3$		Perovskite	94.0	3800	3.2	130	996
3866	3SrO-Ta_2O_5-3TiO_2	1400/5h	Composite	94.0	5200			53
3867	$(Pb_{0.6}Ni_{0.4})(Mg_{1/3}Nb_{2/3})O_3$		Perovskite	94.0	3800		130	996
3868	CaO-Sm_2O_3-Li_2O-TiO_2+1 wt% Li_2O-Bi_2O_3-TiO_2	1400		94.0	6000		7	1603
3869	$Pb_{0.48}Ca_{0.52}[(Fe_{1/2}Nb_{1/2})_{0.95}Sn_{0.05}O_3$	1150/3h	Perovskite Orthorhombic	94.3	5950		24	1497

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
3870	$Ca_{1-x}Sm_{2x/3}TiO_3$ (x=0.6)	1450	Perovskite, Orthorhombic	94.5	14900	5		1604
3871	CaO-BaO-Li_2O-Sm_2O_3-TiO_2 (14:4:9:12:63)	1325		94.5	7400		3	1605
3872	$Ba_{6-3x}Nd_{8+2x}Ti_{18}O_{54}$ x=0.5+10 wt% $Bi_4Ti_3O_{12}$	1300/3h	Tungsten Bronze	94.9	5620		21	1606
3873	$Ba_{6-3x}Pr_{8+2x}Ti_{18}O_{54}$		Tungsten Bronze Orthorhombic	95.0	6000	–	200	1607, 1608
3874	$Ba_4Sm_{5.33}Li_4Ti_{18}O_{54}$	1350	Tungsten Bronze Orthorhombic	95.0	1000	4.4	142	1567
3875	$Ba_{6-3x}(La_{1-y-z}Sm_yBi_z)_{8+2x}Ti_{18}O_{54}$ (x=2/3, y=0.5, z=.08)	1320/3h	Tungsten Bronze Orthorhombic	95.0	3510	3.8	3	1571
3876	$0.3(Sm_{1/2}Li_{1/2})TiO_3$-$0.7(Sm_{1/2}Na_{1/2}Ti)O_3$	1350	Tetragonal	95.0	1000	10		1521
3877	$0.98TiO_2$-$0.02Bi_2Ti_4O_{11}$	1200	Composite	95.0	18000		351	1372
3878	$(Ba_{0.6}Pb_{0.4})_{6-3x}La_{8+2x}Ti_{18}O_{54}$ (x=1.5)	1380	Tungsten Bronze Orthorhombic	95.0	6000		200	1566
3879	$0.3Sm_{1/2}Li_{1/2}TiO_3$-$0.7Sm_{1/2}Na_{1/2}TiO_3$	1300	Perovskite	95.0	1000		−240	1521
3880	Pb,Ca(Fe, W, Nb)O_3	1000	Perovskite	95.7	3840		10	1480
3881	$0.67Ca_{2/5}sm_{2/5}TiO_3$-$0.33Li_{1/2}Sm_{1/2}TiO_3$	1300/3h	Perovskite	95.5	7200		0	1548
3882	$Ba_{6-3x}(Nd_{1-y}Bi_y)_{8+2x}Ti_{18}O_{54}$ (x=2/3, y=0.12)		Tungsten Bronze Orthorhombic	95.8	5820	4	8	1588
3883	$Ba_{6-x}Sm_{8+2x}Ti_{18}O_{54}$ (x=0.3) hot pressed	1300	Tungsten bronze	96.0	1440		−14	1574
3884	CaO-BaO-Li_2O-Sm_2O_3-TiO_2 (14:4:8:12:63)	1325		96.0	7580		−6	1609
3885	$0.92Ba_{4.5}(Nd_{1-y}Bi_y)_9Ti_{18}O_{54}$-$0.08BaTi_4O_9$ (y=0.12)		Tungsten Bronze Orthorhombic	96.0	5590		27	1610
3886	$0.4Ca_{0.6}Sm_{0.8/3}TiO_3$-$0.6(Li_{0.5}Nd_{0.5})TiO_3$+3 wt% $BaCu(B_2O_5)$	1100	Perovskite Orthorhombic	96.3	3100		−20	1611
3887	CaO-SrO-Li_2O-$0.83Sm_2O_3$-$0.17Yb_2O_3$ TiO_2		Perovskite Orthorhombic	96.4	2690	–	36	1612
3888	$Ba_{6-3x-z}Sr_zNd_{8+2x-y}$ $Bi_yTi_{18}O_{54}$ (y=1, x=0.5)		Tungsten Bronze Orthorhombic	97.0	5500		22	1582
3889	$Sr(Bi_{1-x}Nd_x)_8Ti_7O_{27}$ (x=0.1)			97.0	740			1583

3890	$0.3CaTiO_3$-$0.4(Li_{1/2}Nd_{1/2})TiO_3$-$0.3(Dy_{1/3}Nd_{1/3})TiO_3$	1350/3h	Orthorhombic Pbnm Perovskite	97.6	5150		0	1498
3891	$0.98TiO_2$-$0.019Bi_2O_3$		Mixture phases	97.8	3700		354	1434
3892	TiO_2+2 wt% CuO	900/2h	Tetragonal rutile	98.0	14000		374	1613
3893	$0.92Ba_{4.5}(Nd_{1-y}Bi_y)_9Ti_{18}O_{54}$-$0.08BaTi_4O_9$ (y=0.145)		Tungsten Bronze Orthorhombic	98.0	5500		17	1610
3894	$Ca_{1-x}Nd_{2x/3}TiO_3$ (x=0.39)	1400	Perovskite Orthorhombic	98.0	8560	7	247	1599
3895	(1-x)$Ca_{2/5}Sm_{2/5}TiO_3$-x$Li_{1/2}Nd_{1/2}TiO_3$ (x=0.3)	1300/3h	Perovskite Orthorhombic	98.0	5100	5		1614
3896	$0.75Bi_2O_3$-$0.25Nb_2O_5$	930/3h	Flourite δ-Bi_2O_3 Fm-3m	98.0	300		−154	1396
3897	$(Nd_{1/2}Na_{1/2})TiO_3$		Perovskite Orthorhombic	98.0	2700		190	1615
3898	$Ca(Zr_xTi_{1-x})O_3$ (x=0.4)	1430/15h		98.0	5400	2.49	792	916
3899	$Bi_2(Zn_{1-x}Mg_x)_{2/3}Nb_{4/3}O_7$ (x=0.5)	900	Monoclinic+cubic	98.0	3000			1616
3900	$(Ca_{0.275s}Sm_{0.4}Li_{0.25})TiO_3$+0.5 wt% B_2O_3-Li_2O	1200/3h	Perovskite Orthorhombic	98.7	5930		−4	1617
3901	CaO-BaO-Li_2O-Sm_2O_3-TiO_2 (14:2:9:12:63)	1325		98.7	6180		8	1605
3902	$Ba_4Sm_{(28-y)/3}Li_yTi_{18}O_{54}$ (y=8)	1300	Tungsten Bronze Orthorhombic	98.8	280		515	1566
3903	$Ba_{6-3x}(La_{1-y-z}Sm_yBi_z)_{8+2x}Ti_{18}O_{54}$ (x=2/3, y=0.7, z=0.08)	1325/3h	Tungsten Bronze Orthorhombic	99.0	4920	4.38	−18	1571
3904	$0.7Ca_{2/5}Sm_{2/5}TiO_3$-$0.3Li_{1/2}Nd_{1/2}TiO_3$	1200/3h	Perovskite	99.0	6200		9	1614, 1618
3905	$Ba_{6-x}Nd_{8+2x}Ti_{18}O_{54}$ (x=0.3) hot pressed	1300	Tungsten Bronze	99.0	3680		110	1574
3906	$(Ca_{1-x}Nd_{2x/3})TiO_3$ (x=0.6)	1300	Perovskite	99.0	3500	3.2		1619
3907	$Sr_2Ce_2Ti_5O_{16}(Sr_{1-3x/2}Ce_xTiO_3$ x=0.4)+0.4 wt% MoO_3	1300/2h	Psuedocubic	99.0	9700		306	1620
3908	TiO_2 (microwave sint)	1210	Teragonal	99.0	30800	4.42		1621
3909	$Ba_{6-3x}(Nd_{1-y}Bi_y)_{8+2x}Ti_{18}O_{54}$ (x=2/3, y=0.15)		Tungsten Bronze Orthorhombic	99.1	5290		−6	1588
3910	CaO-SrO-Li_2O-0.83Sm_2O_3-0.17Dy_2O_3-TiO_2		Perovskite Orthorhombic	99.5	5930	–	30	1612

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
3911	$Pb_{0.5}Ca_{0.5}[(Fe_{1/2}Nb_{1/2})_{0.9}Sn_{0.1}O_3$	1150/3h	Perovskite, Orthorhombic	99.6	6570		32	1497
3912	$Sr_5Ti_4O_{13}(Sr_{n+1}Ti_nO_{3n+1})$		Perovskite	99.8	4000	1.9	801	1358
3913	$(Pb_{1/2}Ca_{1/2})_{0.94}(La_{1/2}Nd_{1/2})_{0.06}$ $[Fe_{1/2}Nb_{1/2}]O_{3+d}$	1200/3h	Perovskite Orthorhombic	99.9	5800	5.5	0	1622
3914	$(Ca_{1-x}Nd_{2x/3})TiO_3$ (x=0.5)	1300		100.0	14600	3.2		1619
3915	$Ba(Nd_{0.82-z}Sm_zBi_{0.18})Ti_4O_{12}$ (z=0.1)	1300/2h	Orthorhombic Tungsten Bronze	100.0	3950	4.7		1586
3916	$[(Pb_{0.5}Ca_{0.5})_{0.95}Nd_{0.05}](Fe_{1/2}Nb_{1/2})O_3$		Perovskite	100.0	5800		0	1623
3917	$CaO\text{-}SrO\text{-}Li_2O\text{-}(1\text{-}x)Sm_2O_3\text{-}xDy_2O_3\text{-}TiO_2$ (x=0.17)			100.0	5900		30	1498
3918	$0.45CaTiO_3\text{-}0.35(Li_{1/2}Nd_{1/2})TiO_3\text{-}0.2(Dy_{1/3}Nd_{1/3})TiO_3$	1350/3h	Orthorhombic Pbnm Perovskite	100.1	6430		118	1498
3919	$16CaO\text{-}9Li_2O\text{-}12Sm_2O_3\text{-}63TiO_2$+0.75 wt% V_2O_5	1200/3h	Composite	100.4	5600		7	1624
3920	$0.05Pb(Fe_{2/3}W_{1/3})O_3\text{-}0.95Pb_{0.45}Ca_{0.55}(Fe_{1/2}Nb_{1/2})O_3$	1000	Perovskite	100.8	3250		20	1480
3921	$(Pb,Ca)ZrO_3$		Perovskite	>100	1000	–	–	1602
3922	$Ba_{6-3x-z}Pb_zNd_{8+2x-y}Bi_yTi_{18}O_{54}$ (y=1, z=1.0, x=0.5)		Tungsten Bronze Orthorhombic	101.0	4000		–4	1582
3923	$Bi_{1.733}(Zn_{0.733}Nb_{4/3})O_{6.67}$	1000	Cubic	101.0	4800	4.8		1625
3924	$(Pb_{0.5}Ca_{0.5})_{0.95}La_{0.05}(Fe_{0.5}Nb_{0.5})O_3$+1 wt% $PbO\text{-}B_2O_3\text{-}V_2O_5$	1050/3h	Perovskite Orthorhombic	101.0	5400		6	1626
3925	$0.55Ca_{0.61}Nd_{0.91}TiO_3\text{-}0.45Li_{1/2}Nd_{1/2}TiO_3$	1400/4h	Perovskite Orthorhombic	101.0	5300	7.2	13	1599
3926	$Ca_{1-x}Sm_{2x/3}TiO_3$ (x=0.4)	1450	Perovskite Orthorhombic	101.0	14090	5		1604
3927	$Ca_{(1-x)}Nd_{2x/3}TiO_3$ (x=0.21)			101.0	8000		–	1545
3928	$CaO\text{-}Sm_2O_3\text{-}Li_2O\text{-}TiO_2$+5 wt% $Li_2O\text{-}Bi_2O_3\text{-}TiO_2$	1250		101.9	5000		0	1603
3929	$Pb_{0.5}Ca_{0.5}[(Fe_{1/2}Nb_{1/2})_{0.95}Sn_{0.05}O_3$	1150/3h	Perovskite Orthorhombic	102.0	4900		38	1497
3930	$Ba_{6-x}La_{8+2x}Ti_{18}O_{54}$ (x=0.7) hot pressed	1300	Tungsten Bronze	102.0	2380		399	1574
3931	$Ba(Nd_{0.82-z}Sm_zBi_{0.18})Ti_4O_{12}$ (z=0.03)	1300/2h		102.0	3650	4.74		1586

3932	TiO_2+0.05 mol% Al_2O_3	1500/10h	Tetragonal rutile $P4_2/mmm$	102.0	47100			1628
3933	TiO_2+0.05 mol% Fe_2O_3	1500/10h	Tetragonal rutile $P4_2/mmm$	102.0	50100			1628
3934	TiO_2+0.05 mol% MnO	1500/10h	Tetragonal rutile $P4_2/mmm$	102.0	48000			1628
3935	TiO_2+0.05 mol% CuO	1500/10h	Tetragonal rutile $P4_2/mmm$	102.0	48000			1628
3936	TiO_2+0.05 mol% ZnO	1500/10h	Tetragonal rutile $P4_2/mmm$	102.0	48900			1628
3937	$0.1La(Mg_{1/2}Ti_{1/2})O_3$-$0.9CaTiO_3$	1350	Perovskite	102.5	20200	4.3	395	932
3938	$Ba_{6-3x}(Nd_{1-y}Bi_y)_{8+2x}Ti_{18}O_{54}$ (x=2/3, y=0.18)		Tungsten Bronze Orthorhombic	102.6	4400	4	−17	1588
3939	$[(Pb_{0.5}Ca_{0.5})_{0.95}La_{0.05}][Fe_{0.5}Nb_{0.5})_{1-y}Ti_y]O_{3+d}$ (y=0)	1250	Perovskite Orthorhombic	102.8	5900		7	1593
3940	CaO-BaO-Li_2O-Sm_2O_3-Nd_2O_3-TiO_2 (14:4:8:10:2:63)	1350	Composite	103.0	7200		2	1612
3941	$0.4CaTiO_3$-$0.5(Li_{1/2}Nd_{1/2})TiO_3$-$0.1(Dy_{1/3}Nd_{1/3})TiO_3$	1350/3h	Orthorhombic Pbnm Perovskite	103.0	4214		146	1498
3942	$Ca_{1-x}Nd_{2x/3}TiO_3$ (x=0.39)	1350	Perovskite Orthorhombic Pnma	103.0	15340		247	1629
3943	$(1-x)Li_{1/2}Sm_{1/2}TiO_3$-$xNaNbO_3$ (x=0.1)			103.0	2120		−3	1630
3944	$Na_{0.5}Sm_{0.5}TiO_3$+0.6 wt% CeO_2	1425/2h	Orthorhombic perovskite	103.0	9600		193	1627
3945	$Ba_4(Sm_{0.7}Bi_{0.3})_{9+1/3}Ti_{18}O_{54}$	1320	Tungsten Bronze Orthorhombic	103.3	2980		9	1568
3946	$(Pb_{1/2}Ca_{1/2})_{0.95}La_{0.05}$ $[Fe_{1/2}Nb_{1/2}]O_{3+\delta}$	1150	Perovskite	103.4	5640		7	1622
3947	$Pb_{0.5}Ca_{0.5}(Fe_{1/2}Nb_{1/2})O_3$		Perovskite	104.0	4000	2.8	26	996
3948	TiO_2	1200	Tetragonal rutile	104.0	44000		–	53, 1631
3949	$Sr(Bi_{1-x}Nd_x)_8Ti_7O_{27}$ (x=0.3)			104.0	350			1583
3950	TiO_2+0.05 mol% Fe	1500	Rutile $P4_2/mmm$	104.0	50300			1631
3951	CaO-Li_2O-Sm_2O_3-TiO_2 (16:9:12:63)	1325		104.1	4320		13	1564, 1605
3952	$Ba_{6-3x}La_{8+2x}Ti_{18}O_{54}$		Tungsten bronze	105.0	2000	–	450	1606, 1607
3953	5BaO-Ta_2O_5 -$3TiO_2$	1400/5h	Composite	105.0	800			53
3954	$0.5Ca_{0.6}La_{0.2667}TiO_3$-$0.5Li_{1/2}Nd_{1/2}TiO_3$	1400/4h	Perovskite Cubic	105.0	7000		5	1632
3955	$Ba(Nd_{0.82-z}Sm_zBi_{0.18})Ti_4O_{12}$ (z=0.12)	1300/2h	Tungsten Bronze	105.0	4150	3.64		1586

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
3956	$Ba_{6-3x}(La_{1-y-z}Sm_yBi_z)_{8+2x}Ti_{18}O_{54}$ (x=2/3, y=0.7, z=0.12)	1325/3h	Tungsten Bronze Orthorhombic	105.1	4170	4.59	−15	1571
3957	$0.45CaTiO_3$-$0.45(Li_{1/2}Nd_{1/2})TiO_3$-$0.1(Dy_{1/3}Nd_{1/3})TiO_3$	1350/3h	Orthorhombic Pbnm Perovskite	105.1	5160		155	1498
3958	$0.7BaTiO_3$-$0.3La(Mg_{1/2}Ti_{1/2})O_3$		Perovskite Pm3m	105.8	6940	4.55	525	933
3959	BaO-$(Nd_{0.8}Bi_{.2})_2O_3$- $4TiO_2$	1300	Tungsten Bronze	106.0	4200		8	168
3960	CaO:BaO:$Li_2O(Sm_{1-y}N_d)_2O_3$:TiO_2 (14:4:8:12:63) (y=0.33)	1400/3h		106.0	6600		22	1609
3961	$0.3Ca_{2/5}Sm_{2/5}TiO_3$-$0.7Li_{1/2}Nd_{1/2}TiO_3$		Perovskite	106.0	3100			1614
3962	$Sr_2Ce_2Ti_5O_{16}(Sr_{1-3x/2}Ce_xTiO_3$ x=0.4)+0.4 wt% NiO	1300/2h	Psuedocubic	106.0	10000		315	1620
3963	$0.5Ca_{2/5}Sm_{2/5}TiO_3$-$0.5Li_{1/2}Nd_{1/2}TiO_3$	1300/3h		106.0	3710	5		1614
3964	$Ca_{1-x}Nd_{2x/3}TiO_3$ (x=0.3)	1400	Perovskite Orthorhombic	107.0	6590	7	316	1599
3965	$Sr_2Ce_2Ti_5O_{16}(Sr_{1-3x/2}Ce_xTiO_3$ x=0.4)+0.4 wt% In_2O_3	1300/2h	Psuedocubic	107.0	9400		310	1620
3966	$Ca_{2/5}Sm_{2/5}TiO_3$-$Li_{1/2}Nd_{1/2}TiO_3$-$0.6TiO_2$	1300/2h		107.0	3300	4	0	1597
3967	CaO-Sm_2O_3-Li_2O-TiO_2 (11:8:5:40)	1250		107.2	5700		0	1633
3968	$0.2Pb(Fe_{2/3}W_{1/3})O_3$-$0.8Pb_{.4}Ca_{.6}(Fe_{1/2}Nb_{1/2})O_3$	930	Perovskite	107.2	3790		48	1480
3969	CaO-SrO-Li_2O-Sm_2O_3-TiO_2		Perovskite Orthorhombic	108.0	5480	–	15	1612
3970	$(Ca_{1-x}Nd_{2x/3})TiO_3$ (x=0.39)	1300	Perovskite	108.0	17200	3		1619
3971	$Sr(Bi_{0.6}Nd_{0.4})_8Ti_7O_{27}$	1260	Aurivillius type	108.0	2000		–	1583
3972	$Ca_{0.6}La_{0.2667}TiO_3$	1400/4h	Perovskite cubic	109.0	17600	4.5	213	1632
3973	$Ba_{3.75}La_{9.5}Ti_{18}O_{54}$		Tungsten Bronze Orthorhombic	109.2	1800	3		1536
3974	$0.1Pb(Fe_{2/3}W_{1/3})O_3$-$0.9Pb_{0.45}Ca_{0.55}(Fe_{1/2}Nb_{1/2})O_3$	930	Perovskite	109.4	3500		5	1480
3975	$Pb_{0.63}Ca_{0.37}ZrO_3$	1450	Perovskite	110.0	3000	2.8		1514
3976	$0.2CaTiO_3$-$0.2(Li_{0.5}Nd_{0.5})TiO_3$	1300	Perovskite	110.0	2600		−15	1634
3977	$(1-x)Ca_{2/5}Sm_{2/5}TiO_3$-$xLi_{1/2}Nd_{1/2}TiO_3$ (x=0.6)	1300/3h	Perovskite	110.0	3400	5	155	1614

3978	$[(Pb_{0.5}Ca_{0.5})_{0.98}Nd_{0.02}](Fe_{1/2}Nb_{1/2})O_3$		Perovskite	110.0	5800		525	1623
3979	$0.15CaO\text{-}0.01SrO\text{-}0.09Li_2O\text{-}0.12Sm_2O_3\text{-}0.63TiO_2$			110.0	4500	3	8	1564
3980	$0.3CaTiO_3\text{-}0.4(Li_{1/2}Nd_{1/2})TiO_3\text{-}0.3La_{1/3}Nd_{1/3}TiO_3$	1350	Perovskite composite	110.0	1400		22	1498
3981	$Ba_{6-x}La_{8+2x}Ti_{18}O_{54}$ (x=0.5) hot pressed	1300	Tungsten Bronze Orthorhombic	110.0	2460			1574
3982	$0.2CaTiO_3\text{-}0.5(Li_{1/2}Nd_{1/2})TiO_3\text{-}0.3(La_{1/3}Nd_{1/3})TiO_3$	1350/3h	Perovskite composite	110.4	1460		315	1498
3983	$Ba_2Sr_2Sm_2Ti_{4+x}Ta_{6-x}O_{30-x/2}$ (x=3)	1340/2h		111.0	200	3.3		1635
3984	$[(Ca_x(La,Nd)_{2/3-2x/3}]TiO_3$ (x=0.9)	1350/24h	Tetragonal I4/mcm	111.3	4500		273	1392
3985	$Ba_{6-3x}(La_{1-y-z}Sm_yBi_z)_{8+2x}Ti_{18}O_{54}$ (x=2/3, y=0.5, z=0.12)	1320/3h	Tungsten Bronze Orthorhombic	111.3	2470	3.7	−30	1571
3986	$Ba_{6-3x}(La_{1-y-z}Sm_yBi_z)_{8+2x}Ti_{18}O_{54}$ (x=2/3, y=0.7, z=0.16)	1300/3h	Tungsten Bronze Orthorhombic	111.4	2530	4.3	−21	1571
3987	$(1\text{-}x)Ca_{0.8}Sr_{0.2}TiO_3\text{-}xLi_{0.5}Nd_{0.5}TiO_3$ (x=0.87)		Perovskite Tetragonal	111.6	2000		−3	1636
3988	$[(Pb_{0.5}Ca_{0.5})_{0.95}La_{0.05}][Fe_{0.5}Nb_{0.5})_{1-y}Ti_y]O_{3+d}$ (y=0.05)	1250	Perovskite Orthorhombic	111.7	5200		24	1593
3989	$0.6(Na,La)TiO_3\text{-}0.4(Li,Sm)TiO_3$		Perovskite	112.0	1060		18	1421
3990	$Sr_2Ce_2Ti_5O_{16}(Sr_{1-3x/2}Ce_xTiO_3$ x=0.4)+0.4 wt% CeO_2	1300/2h	Psuedocubic	112.0	9400		305	1620
3991	$Pb_{0.95}Ca_{.05}ZrO_3$	1250	Perovskite	112.0	720	2.8	–	1514
3992	$Ba_{6-3x-}Nd_{8+2x-y}Bi_yTi_{18}O_{54}$ (y=2, x=0.5)		Tungsten Bronze Orthorhombic	112.0	3000		25	1582
3993	$CaO\text{-}Sm_2O_3\text{-}Li_2O\text{-}TiO_2$+1 wt% $Li_2O\text{-}Bi_2O_3\text{-}TiO_{20}$	1250		112.1	3600		1	1603
3994	$0.05Pb(Fe_{2/3}W_{1/3})O_3\text{-}0.95Pb_{0.5}Ca_{0.5}(Fe_{1/2}Nb_{1/2})O_3$	1000	Perovskite	112.2	2730		52	1480
3995	$CaO\text{-}SrO\text{-}Li_2O\text{-}0.83Sm_2O_3\text{-}0.17Nd_2O_3\text{-}TiO_2$		Perovskite Orthorhombic	112.5	4900	–	13	1612
3996	$[Ca_{0.4}(Li_{1/2}Nd_{1/2})_{0.6}]TiO_3$	1350	Perovskite	112.6	4480		8	1464
3997	$Sr_2Ce_2Ti_5O_{16}(Sr_{1-3x/2}Ce_xTiO_3$ x=0.4)	1300/2h	Psuedocubic	113.0	8000		306	1620

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
3998	$Sr_2Ce_2Ti_5O_{16}(Sr_{1-3x/2}Ce_xTiO_3$ x=0.4)+0.2 wt% La_2O_3	1300/2h	Psuedocubic	113.0	9700		287	1620
3999	$0.3CaTiO_3$-$0.7Li_{1/2}Sm_{1/2}TiO_3$	1300/3h	Perovskite Orthorhombic	114.0	3700		12	1637
4000	$Ba_2Sr_2Sm_2Ti_{4+x}Ta_{6-x}O_{30-x/2}$ (x=2)	1340/2h		114.0	150	3.63		1635
4001	$Ba_2Sr_2Sm_2Ti_{4+x}Ta_{6-x}O_{30-x/2}$ (x=2.5)	1340/3h		114.0	140		–	1635
4002	$0.25CaTiO_3$-$0.75(Li_{1/2}Nd_{1/2})TiO_3$+10 wt% $Bi_4B_2O_9$	1200		114.0	2830		−8	1638
4003	$Ba_4(Nd_{0.7}Bi_{0.3})_{9.33}Ti_{18}O_{54}$	1320	Tungsten Bronze Orthorhombic	114.1	2700		44	1568
4004	CaO-SrO-Li_2O-$0.83Sm_2O_3$-$0.17Pr_6O_{11}O_3$-TiO_2		Perovskite Orthorhombic	114.3	4850	–	14	1612
4005	BaO-$(Nd_{0.7}Bi_{0.3})_2O_3$-$4TiO_2$	1275	Tungsten Bronze	115.0	2100		26	168
4006	TiO_2	1000	Rutile	115.0	46000			1639
4007	$0.7(Li_{1/2}Nd_{1/2})TiO_3$-$0.3(Na_{1/2}Sm_{1/2})TiO_3$		Orthorhombic	115.0	3800		15	1640
4008	$Ba_{6-3x}(La_{1-y-z}Sm_yBi_z)_{8+2x}Ti_{18}O_{54}$ (x=2/3, y=0.5, z=0.15)	1300/3h	Tungsten Bronze Orthorhombic	115.4	1884	3.58	−22	1571
4009	$0.3CaTiO_3$-$0.4(Li_{1/2}Nd_{1/2})TiO_3$-$0.3(La_{1/3}Nd_{1/3})TiO_3$	1350/3h	Orthorhombic Pbnm Perovskite	116.0	1675		23	1498
4010	$[(Pb_{0.5}Ca_{0.5})_{0.95}La_{0.05}][Fe_{0.5}Nb_{0.5})_{1-y}Ti_y]O_{3+d}$ (y=0.1)	1200	Perovskite Orthorhombic	116.6	4950	17	17	1576
4011	$0.3(Na_{1/2}La_{1/2})TiO_3$-$0.7(Li_{1/2}Sm_{1/2})TiO_3$	1300	Perovskite Orthorhombic	117.0	2280	3	−19	1421
4012	$Ba_{6-3x}(La_{1-y-z}Sm_yBi_z)_{8+2x}Ti_{18}O_{54}$ (x=2/3, y=0.7, z=0.2)	1275/3h	Tungsten Bronze Orthorhombic	117.0	1780	4.29	−36	1571
4013	$0.6CaTiO_3$-$0.1(Li_{1/2}Nd_{1/2})TiO_3$-$0.3(La_{1/3}Nd_{1/3})TiO_3$	1350/3h	Orthorhombic Pbnm Perovskite	117.0	3950		258	1498
4014	$0.4CaTiO_3$-$0.3(Li_{1/2}Nd_{1/2})TiO_3$-$0.3(La_{1/3}Nd_{1/3})TiO_3$	1350/3h	Orthorhombic Pbnm Perovskite	117.0	2070		119	1498
4015	CaO-SrO-Li_2O-$0.83Sm_2O_3$-$0.17Sm_2O_3$-TiO_2		Perovskite Orthorhombic	117.5	4120	–	15	1612
4016	$Ca(Zr_{0.4}Ti_{0.6})O_3$		Perovskite Orthorhombic	118.0	6400			906
4017	$Pb_{0.65}Ca_{0.35}ZrO_3$	1450	Perovskite	118.0	1260	2.8	29	1514

4018	$Sr_{5.7}Al_{0.7}Nb_{9.3}O_{30}$	1375	Tetragonal Tungsten Bronze P4bm	118.0	80	3.1		562
4019	$Bi_{1.5}Zn_{0.92}Nb_{1.5}O_{6.92}$+3 wt% ($0.81MoO_3$-0.19CuO)	900/4h	Cubic	118.2	1000	2.3		1641
4020	$Ba_{0.75}Sr_{0.25}(Nd_xBi_{1-x})_2Ti_4O_{12}$ (x=0.75)	1250		118.5	4900		−1	1642
4021	$Ca_{1-x}Nd_{2x/3}TiO_3$ (x=0.2)	1400/4h	Perovskite Orthorhombic	119.0	4200	7.2	433	1599
4022	$Ca_{1-x}Sm_{2x/3}TiO_3$ (x=0.2)	1450/3h	Perovskite Orthorhombic	119.3	12330	5		1604
4023	(1-x)$Li_{1/2}Sm_{1/2}TiO_3$-x$NaNbO_3$ (x=0.2)			120.0	2300		9	1630
4024	$Bi_{1.5}Zn_{0.92}Nb_{1.5}O_{6.92}$+3 wt% ($0.21BaCO_3$-0.79CuO)	950/4h	Cubic	120.1	1050	2.3		1641
4025	$Ba_{6-3x}(La_{1-y-z}Sm_yBi_z)_{8+2x}Ti_{18}O_{54}$ (x=2/3, y=0.5, z=0.18)	1300/3h	Tungsten Bronze	120.2	1571	3.8	−15	1571
4026	0.4$CaTiO_3$-0.5($Li_{1/2}Nd_{1/2}$)TiO_3-0.1($La_{1/3}Nd_{1/3}$)TiO_3	1350/3h	Orthorhombic Pbnm Perovskite	121.3	3040		113	1498
4027	0.45$CaTiO_3$-0.25($Li_{1/2}Nd_{1/2}$)TiO_3-0.3($Dy_{1/3}Nd_{1/3}$)TiO_3	1350/3h	Orthorhombic Pbnm Perovskite	121.3	3650		109	1498
4028	($La_{1/2}Na_{1/2}$)TiO_3	1300	Cubic perovskite	122.0	9800	3	480	1421
4029	0.15CaO-0.011SrO—0.09Li_2O-13Sm_2O_3-0.63TiO_2			123.0	4150		10.8	1612
4030	0.5$CaTiO_3$-0.4($Li_{1/2}Nd_{1/2}$)TiO_3-0.1($La_{1/3}Nd_{1/3}$)TiO_3	1350/3h	Orthorhombic Pbnm Perovskite	123.0	4148		136	1498
4031	$Sr_3Ce_2Ti_6O_{19}$($Sr_{1-3x/2}Ce_xTiO_3$ x=0.333)	1350/2h	Psuedocubic	123.0	10000		392	1643
4032	$Ba_{6-3x}(La_{1-y-z}Sm_yBi_z)_{8+2x}Ti_{18}O_{54}$ (x=2/3, y=0.5, z=0.2)	1300/3h	Tungsten Bronze Orthorhombic	124.5	1430	3.58	−9	1571
4033	0.4$CaTiO_3$-0.6$Li_{1/2}Nd_{1/2}TiO_3$		Perovskite Orthorhombic	126.0	2600	2.1	127	1644
4034	$Bi_{1.5}Zn_{0.92}Nb_{1.5}O_{6.92}$	1050/4h		126.2	520	2.4		1495
4035	$Ba_3La_3Ti_5Ta_5O_{30}$	1425		126.6	110	3.1	100	1645
4036	$(Pb_{1-x}Ca_x)[Fe_{1/2}Nb_{1/2}]_{1-y}Zr_y]O_3$ (y=0.01, x=0.4)	1150	Perovskite	126.7	3630	3	118	1488
4037	x$Bi_4B_2O_9$-(1-x)(0.2$CaTiO_3$-0.8$Li_{0.5}Nd_{0.5}TiO_3$)		Composite	127.0	2700		−4	287

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
4038	$0.2Pb(Fe_{2/3}W_{1/3})O_3$-$0.8Pb_{0.45}Ca_{0.55}(Fe_{1/2}Nb_{1/2})O_3$	930	Perovskite	127.2	2300		96	1480
4039	$0.6CaTiO_3$-$0.3(Li_{1/2}Nd_{1/2})TiO_3$-$0.1(La_{1/3}Nd_{1/3})TiO_3$	1350/3h	Orthorhombic Pbnm Perovskite	128.2	4460		256	1498
4040	$0.5(Li_{1/2}Nd_{1/2})TiO_3$-$0.5(Na_{1/2}Nd_{1/2})TiO_3$		Perovskite	130.0	2000		20	1640
4041	$0.2CaTiO_3$-$0.8Li_{.5}Nd_{.5}TiO_3$+5 wt% $Bi_2Ti_2O_7$	1300	Perovskite Orthorhombic Pbnm	130.0	2400		20	1646
4042	$(La_{0.44}Pb_{0.33})TiO_3$	1300	Orthorhombic Ibmm	130.0	5000	3	300	1547
4043	$Ba_4La_2Ti_4Ta_6O_{30}$	1425		131.8	540	3.47	–	1645
4044	$Pb_{07}Ca_{03}ZrO_3$	1400	Perovskite	132.0	1800	2.8	86	1514
4045	$0.2CaTiO_3$-$0.68(Li_{1/2}Nd_{1/2})TiO_3$-$0.12(La_{1/3}Nd_{1/3})TiO_3$	1350/3h	Tetragonal P-4b2 Perovskite	132.6	1450		−17	1498
4046	$Sr_4Ce_2Ti_7O_{22}$	1325	Psuedocubic perovskite	133.0	11100	2.3		1643
4047	$Sr_{0.8}Ca_{0.2}TiO_3$	1400	Perovskite	133.9	3950	1.62	1534	1222
4048	$5CaO$-$2Nb_2O_5$-$3TiO_2$	1300/5h	Composite	134.0	1500			53
4049	$0.8CaTiO_3$-$0.2(Li_{1/2}Nd_{1/2})TiO_3$		Perovskite	134.0	13800		200	1644
4050	$0.5(Ca_{0.7}Nd_{0.2})TiO_3$-$0.5(Li_{1/2}Nd_{1/2})TiO_3$	1150/4h	Composite	134.0	2200		20	1647
4051	$Sr_4Ce_2Ti_7O_{22}(Sr_{1-3x/2}Ce_xTiO_3$ x=0.286)	1350/2h	Psuedocubic perovskite	136.0	10800		428	1643
4052	$0.4CaTiO_3$-$0.48(Li_{1/2}Nd_{1/2})TiO_3$-$0.12(La_{1/3}Nd_{1/3})TiO_3$	1350/3h	Perovskite Orthorhombic Pbnm	136.4	2220		122	1498
4053	$La_{(1-x)/3}Na_xNbO_3$ (x=0.02)	1350.2h	Peerovskite	138.0	1700		350	1648
4054	$Ca(Zr_xTi_{1-x})O_3$ (x=0.3)	1430/15h	Perovskite	138.0	4900	2.3	588	906
4055	$Ca_{0.16}Sr_{0.04}Li_{0.4}Nd_{0.4}TiO_3$+0.75 mol% Li	1270	Perovskite Pnma	138.0	1600		52	1649
4056	$0.4CaTiO_3$-$0.6(LiNd)TiO_3$		Perovskites	139.0	3250		110	1650
4057	$Pb_{0.6}Ca_{0.4}[(Fe_{1/2}Nb_{1/2})_{0.95}Sn_{0.05}O_3$	1150/3h	Perovskite cubic	139.4	2450		140	1497
4058	$PbZrO_3$-CeO_2	1250/4h	Composite	140.0	2500	3	−1080	1651
4059	$0.6PbZrO_3$-$0.4Ca(Fe_{1/2}Nb_{1/2})O_3$	1250/3h	Perovskite	140.7	1776	3.02	120	1576
4060	$(Ca_{1-x}Nd_{2x/3})TiO_3$ (x=0.15)	1300	Perovskite	141.0	11300	2.77		1619
4061	$Ca(Zr_xTi_{1-x})O_3$ (x=0.2)	1430/15h	Perovskite	141.0	5900	2.14	732	906
4062	$(Ca_{1-x}Nd_{2x/3})TiO_3$ (x=0.27)	1300	Perovskite	141.0	10350	3.07		1619

4063	$0.6CaTiO_3$-$0.28(Li_{1/2}Nd_{1/2})TiO_3$-$0.12(La_{1/3}Nd_{1/3})TiO_3$	1350/3h	Perovskite Orthorhombic Pbnm	142.0	3327		283	1498
4064	$Sr_5Ce_2Ti_8O_{25}$	1325	Psuedocubic Perovskite	142.0	11100	2.3		1643
4065	$Pb_{0.6}Ca_{0.4}[(Fe_{1/2}Nb_{1/2})_{0.9}Sn_{0.1}O_3$	1150/3h	Perovskite Cubic	142.6	2520		130	1497
4066	$Sr_5Ce_2Ti_8O_{25}(Sr_{1-3x/2}Ce_xTiO_3$ x=0.25)	1375/2h	Psuedocubic	143.0	11000		478	1643
4067	$Sr_{0.8}Ca_{0.2}TiO_3$		Perovskite Tetragonal I4/mcm	145.0	4050	1.62	1534	1358
4068	$Bi_{1.5}Zn_{0.92}Nb_{1.5}O_{6.92}$+0.6 wt% V_2O_5	850/1h		148.0	120			1495
4069	$0.4CaTiO_3$-$0.5(LiNd)TiO_3$-$0.1(Bi,Na)TiO_3$		Composite	148.0	2650		123	1650
4070	$0.4CaTiO_3$-$0.6Li_{1/2}Nd_{1/2}TiO_3$+15 wt% Bi_2O_3-$2TiO_2$		Composite	150.0	2200		65	1646
4071	$Ca(Zr_xTi_{1-x})O_3$ (x=0.1)	1410/15h	Perovskite	150.0	5000	2.02	749	906
4072	$0.4CaTiO_3$-$0.6Li_{0.5}Nd_{0.5}TiO_3$+10 wt% $Bi_2Ti_2O_7$	1175		150.0	2400		70	1644
4073	$Bi_{1.5}ZnNb_{1.5}O_7$		Cubic	150.0	300	2.9		1652, 1653
4074	$Sr_6Ce_2Ti_9O_{28}(Sr_{1-3x/2}Ce_xTiO_3$ x=0.222)	1375/2h	Psuedocubic Perovskite	150.0	9600		497	1643
4075	$Ca(Zr_{0.2}Ti_{0.8})O_3$		Perovskite Orthorhombic	153.0	4400			906
4076	$Pb_{0.6}Ca_{0.4}(Fe_{1/2}Nb_{1/2})O_3$		Perovskite	154.0	1700	2.3	135	996
4077	$Sr_7Ce_2Ti_{10}O_{31}$ $(Sr_{1-3x/2}Ce_xTiO_3$ x=0.2)	1375/2h	Psuedocubic Perovskite	157.0	9300		544	1643
4078	$CaTiO_3$	1400	Orthorhombic Perovskite Pbnm	162.0	1290	1.5	859	1358
4079	$0.1Pb(Fe_{1/2}Nb_{1/2})O_3$-$0.9CaTiO_3$	1200/3h	Perovskite cubic	164.0	6180	2.8	583	1654
4080	$Pb_{0.75}Ca_{0.25}ZrO_3$	1300	Perovskite	167.0	960	2.4	111	1514
4081	$Sr_8Ce_2Ti_{11}O_{34}$ $(Sr_{1-3x/2}Ce_xTiO_3$ x=0.182)	1375/2h	Psuedocubic Perovskite	167.0	8000		601	1643
4082	$PbZrO_3$-CeO_2 -$SrTiO_3$-NiO-Nb_2O_5	1250/4h		170.0	3600	3	800	1651
4083	$Sr_{0.1}Ca_{0.9}TiO_3$		Orthorhombic Perovskite	170.0	8320	1	931	1358
4084	$0.3Pb(Fe_{1/2}Nb_{1/2})O_3$-$0.7CaTiO_3$	1200/3h	Perovskite Cubic	172.7	810	2.7	392	1654
4085	$Sr_9Ce_2Ti_{12}O_{37}$ $(Sr_{1-3x/2}Ce_xTiO_3$ x=0.167)	1375/2h	Psuedo Cubic Perovskite	173.0	3000		637	1643
4086	$0.4CaTiO_3$-$0.4(LiNd)TiO_3$-$0.2(Bi,Na)TiO_3$			174.0	1300		91	1650
4087	$KTaO_3$	1340	Cubic Pm3m	177.0	2900	3.6		1655

(*continued*)

No.	Material	ST (°C)	Crystal structure	ε_r	Qf (GHz)	f_0	τ_f	Reference
4088	$Sr_{10}Ce_2Ti_{13}O_{40}$ ($Sr_{13x/2}Ce_xTiO_3$ x=0.154)	1400/2h	Psuedo Cubic Perovskite	179.0	8000		724	1643
4089	$Ca_{1.8}Sr_{0.2}Bi_4Ti_5O_{18}$	1175/5h	Orthorhombic	180.0	8000			1656
4090	$Sr_{0.2}Ca_{0.8}TiO_3$		Perovskite	181.0	3900	1.4	991	1358
4091	$Sr_{11}Ce_2Ti_{14}O_{43}$ ($Sr_{1-3x/2}Ce_xTiO_3$ x=0.154)	1400/2h	Psuedo Cubic Perovskite	185.0	6000		789	1643
4092	$0.4CaTiO_3$-$0.3(LiNd)TiO_3$-$0.3(Bi,Na)TiO_3$			204.0	1300		147	1650
4093	$Sr_{0.4}Ca_{0.6}TiO_3$		Perovskite	218.0	7180	1.3	1164	1358
4094	$Ba_{0.5}Sr_{0.5}TiO_3$-$BaWO_4$			225.0	580			1657
4095	$Sr_8Ce_2PbTi_{12}O_{36}$	1300		229.0	4400	2	950	1658
4096	$0.5Pb(Fe_{1/2}Nb_{1/2})O_3$-$0.5CaTiO_3$	1200/3h	Perovskite Cubic	232.1	870	2.3	433	1654
4097	$Sr_{0.5}Ca_{0.5}TiO_3$		Perovskite Orthorhombic Pbnm	236.0	4120	1.2	1234	1358
4098	$0.4CaTiO_3$-$0.2(LiNd)TiO_3$-$0.4(Bi,Na)TiO_3$			253.0	740			1650
4099	$Pb_{1.5}Nb_2O_{6.5}$		Cubic	259.0	3010		1239	1659
4100	$Ca_{0.5}Sr_{0.5}TiO_3$	1350	Orthorhombic	260.0	7000		384	1660
4101	$SrTiO_3$		Cubic perovskite Pm-3m	270.0	3000	2	1500	1358, 1661
4102	$Ag(Nb_{1/3}Ta_{2/3})O_3$+1 wt% CuO	875	Perovskite Orthorhombic pbcm	271.0	800			1662
4103	$BaTi_{0.7}Ga_{0.15}Nb_{0.15}O_3$	1500/4h	Perovskite Tetragonal P4mm	275.0	100	2.4		1373
4104	$Ag(Nb_{2/4}Ta_{2/4})O_3$	1200	Perovskite Pbcm Orthorhombic	285.0	300	2.4		1662
4105	$Ag(Nb_{1/4}Ta_{3/4})O_3$	925	Perovskite Pbcm	295.0	600	2.6		1662
4106	$Sr_7Ce_2Pb_2Ti_{12}O_{37}$	1250		301.0	4300	1.8	1287	1658
4107	40 wt% $Ba_{0.6}Sr_{0.4}TiO_3$-60 wt% $BaZn_6Ti_6O_{19}$	1300	Composite	324	400			1663
4108	$0.8PbZrO_3$-$0.2Ca(Fe_{1/2}Nb_{1/2})O_3$	1250/3h	Perovskite Rhombohedral	335.8	314	2	386	1576
4109	$Bi_6Ti_5TeO_{22}$	1010/10h		350.0	220		2600	1131

4110	$Ba_{0.2}Sr_{0.8}TiO_3$	1450/3h	Cubic perovskite	363.0	2400	2.3		1664
4111	$Ba_{0.3}Sr_{0.7}TiO_3$-10 mol% $MgTiO_3$	1350	Cubic perovskite	365.0	1500			1665
4112	$AgTa_{0.57}Nb_{0.43}O_3$	1200	Perovskite	380.0	800			1666
4113	$Ag(Nb_{2/4}Ta_{2/4})O_3$+1 wt% CuO	900	Perovskite	398.0	400	2.3		1662
4114	$Ag_{0.52}Ta_{0.48}O_3$	1250/20h	Perovskite, Monoclinic P2/m	415.0	430	2		1667
4115	$Ba_{0.5}Sr_{0.5}TiO_3$		Perovskite	420.0	2250			1358
4116	$Sr_6Ce_2Pb_3Ti_{12}O_{36}$	1200		430.0	2300	1.7	2218	1658
4117	$Ba_{0.5}Sr_{0.5}Ti_{1-3y/2}W_yO_3$ (y=0.05)			431.0	365	2.11		1668
4118	$Ba_{0.4}Sr_{0.6}Ti_{0.9}Mn_{0.1}O_3$	1400/4h	Perovkite	449.0	580			1669
4119	$Ag(Nb_{3/4}Ta_{1/4})O_{3-}$ $Ag(Nb_{1/4}Ta_{3/4})O_3$ (5:55)	925	Perovskite Orthorhombic	463.0	200	1.97		1662
4120	$Ag(Nb_{3/4}Ta_{1/4})O_3$	925	Perovskite Orthorhombic Pbcm	487.0	200	1.89		1662
4121	$Ba_{0.8}Sr_{0.2}TiO_3$	1450/3h	Perovskite	560.0	850	1.9		1664
4122	$0.7Pb(Fe_{1/2}Nb_{1/2})O_3$-$0.3CaTiO_3$	1150/3h	Perovskite Cubic	566.0	120	1.42	1075	1654
4123	60 wt% $Ba_{0.6}Sr_{0.4}TiO_3$-40 wt% $BaZn_6Ti_6O_{19}$	1300	Composite	584.0	250			1663
4124	$Ba_{0.4}Sr_{0.6}TiO_3$	1450/3h	Perovskie	672.0	1600	1.7		1664
4125	$BaTi_{0.5}Ga_{0.25}Nb_{0.25}O_3$	1500/4h	Perovskite Tetragonal P4mm	760.0	40	2.4		1373
4126	$Ba_{0.6}Sr_{0.4}TiO_3$	1450/3h	Perovskie	838.0	300	1.6		1664
4127	$Ba_{0.4}Sr_{0.6}TiO_3$		Perovskite	1038.0	720			1670
4128	$Ba_{0.6}Sr_{0.4}TiO_3$+2 mol% $BaCu(B_2O_{5)}$		Perovskite	2553.0	330			1671
4129	$Ba_{0.6}Sr_{0.4}TiO_3$+0.5 wt% $MgCo_2(VO_4)_2$		Perovskite	2763.0	300	1		1672

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