2018.08.12

Solubility Table

doggyshakespeare.github.io/solubilitytable.html

Solubility describes the maximum amount of a substance (the solute) can dissolve in a given amount of solvent, in this case water. This maximally dissolved solution is termed "saturated", and additional solute added will not dissolve. As different compounds have different solubilities, a table is needed for quick reference of these values. This solubility table gives the solubility of a variety of salts (a positive ion + a negative ion), either as a number in grams of salt per 100 g of H2O or qualitatively using a symbol (refer to the info box below).

Some numbers are written in scientific notation, where for example "2E-3" is equal to 2*10^-3 = 0.002. All numbers here have the appropriate number of significant figures. The values here are the solubilities under "standard conditions": at T = 25.00 °C (298.15 K), p = 101325 Pa (1 atm), and partial pressure of CO2 = 32 Pa (normal atmospheric value). In other conditions the values will be different. Note that under these standard conditions, some salts naturally incorporate H2O in their crystals—these are called "hydrates"—and the solubility values are given in grams of the most stable hydrate under standard conditions.

To be more precise, a substance "dissolves" when it is surrounded by solvent and is no longer lumped together with solute, and for salts, they also break apart into their component ions. When a substance "decomposes", some reaction other than dissolution occurs (e.g. gas may form). For some salts no reliable solubility information could be found, which could mean that they are not stable, or that no studies that report on the solubility could be found.

As this table is available for reference, there is no need to memorize the numerical solubility values. However, it is good to know general trends in solubility; a decent rule of thumb is that any salt with a halide, a halide oxyanion, acetate, sulfate, nitrate, or thiocyanate as the anion, and/or an alkali metal or ammonium as the cation is most likely soluble, and salts that are not made up of any of these ions are insoluble.

Disclaimer: All of these values are obtained from outside sources; I merely compiled them into this table. My website (link in top right corner) contains tables with all my sources and values obtained from each, as well as additional information on the values. As the values were copied by hand, I may have made some mistakes, and even though most of these values should be accurate, I cannot and do not guarantee that the sources contain accurate information, as some of my sources are also compilations and/or provide no references to the original paper(s). I shall not be held liable for any damages resulting from the use of this solubility table. Do your own research when attempting anything risky!

# of grams of compound soluble in exactly 100 g of H2O under standard conditions (T = 25.00 °C (298.15 K), p = 101325 Pa (1 atm), p_CO2 = 32 Pa) s: soluble (m ≥ 1 g) a: a bit soluble (0.01 g ≤ m < 1 g) i: insoluble (m < 0.01 g) d: decomposes (reacts spontaneously) ?: no solubility information			Group 17 (Halide ions)				Halide oxyanions			Soluble oxyanions			Pseudohalides		Simple anions			Insoluble oxyanions					
			Fluoride F -	Chloride Cl -	Bromide Br -	Iodide I -	Perchlorate ClO4 -	Chlorate ClO3 -	Iodate IO3 -	Acetate CH3COO -	Sulfate SO4 2-	Nitrate NO3 -	Thiocyanate SCN -	Cyanide CN -	Hydroxide OH -	Oxide O 2-	Sulfide S 2-	Sulfite SO3 2-	Carbonate CO3 2-	Phosphate PO4 3-	Arsenate AsO4 3-	Oxalate C2O4 2-	Chromate CrO4 2-
	Hydrogen	H +	s	s	193	s	s	s	307.8	s	s	s	s	s	H2O	H2O	s	s	s	s	s	s	s
	Lithium	Li +	0.134	84.54	181	165	59	459	77.9	44.97	34.2	102	120	s	12	d	s	s	1.30	0.027	s	6.24	s
Group 1 (Alkali metals)	Sodium	Na +	4.13	35.96	94.6	184	205	100.	9.47	50.4	28.11	91.2	151	s	1.0E+2	d	20.6	30.7	30.7	14.4	s	3.61	87.6
	Potassium	K +	101.7	35.54	67.8	148	2.08	8.61	9.22	269.3	12	38.3	238	s	117.9	d	s	106.4	111	106	125	s	65.0
	Rubidium	Rb +	s	93.87	116	165	1.5	6.63	2.44	s	50.8	65.0	220	?	s	s	s	s	s	s	s	s	76.24
	Cesium	Cs +	s	191.0	123	84.8	2.00	7.78	2.66	s	182	27.9	190	?	s	s	s	s	s	s	s	s	s
	Ammonium	NH4 +	83.5	39.55	78.3	178	24.5	s	3.84	s	76.4	213	181	s	s	s	s	64.2	s	18.3	s	5.20	s
	Beryllium	Be 2+	s	71.5	s	d	147	?	s	?	41.28	s	s	?	6E-7	i	i	d	a	i	i	63.2	d
	Magnesium	Mg 2+	0.013	56.01	102	146	100.	141.9	9.31	65.59	35.7	71.2	s	s	6.4E-4	i	d	0.52	a	a	d	0.038	54.77
Group 2 (Alkaline earth)	Calcium	Ca 2+	0.0016	81.26	160	210	188	197	a	s	0.205	142.4	s	s	0.155	0.13	d	0.0054	i	0.03	a	i	a
	Strontium	Sr 2+	0.021	54.73	102	177	305.7	176.0	0.165	s	0.0135	80.2	s	s	2.2	a	a	0.0015	i	i	i	a	a
	Barium	Ba 2+	0.161	37.04	100.	221	312.4	37.93	0.0396	79.2	i	10.	167	s	4.91	s	8.94	0.0011	0.0024	i	a	i	i
	Aluminium	Al 3+	0.50	45.14	d	d	s	s	6.07	s	38.5	68.9	?	?	i	2.05	d	d	d	i	i	i	d
	Chromium (III)	Cr 3+	s	s	s	s	?	s	?	s	64	s	s	i	i	i	d	d	s	i	i	?	d
	Manganese (II)	Mn 2+	1.0	77.3	151.2	s	s	s	0.3	s	63.7	71.5	s	?	i	i	i	i	0.0065	a	i	a	i
	Iron (II)	Fe 2+	a	65.0	120.	s	210.2	s	a	s	29.5	87.51	s	i	7.32E-5	i	i	a	a	i	i	a	d
Transition metals	Cobalt (II)	Co 2+	1.4	56.23	110	202.9	113	s	0.5	s	38.3	103	103	i	i	169	i	i	a	a	i	i	i
	Nickel (II)	Ni 2+	2.56	67.5	134	154.4	112	s	0.667	s	40.4	99.2	54.99	i	a	i	i	i	0.0093	i	i	i	i
	Copper (II)	Cu 2+	0.075	75.7	126	i	s	s	148	s	22.0	145	i	i	i	i	i	a	d	i	i	i	i
	Zinc	Zn 2+	2.723	408	488	438	86.12	s	0.7010	s	57.7	120.	a	a	0.0001	0.0003	1E-8	0.330	0.00206	i	i	0.00317	0.0355
	Iron (III)	Fe 3+	5.92	91.2	455	s	s	s	a	s	s	87.16	s	?	i	i	d	d	d	a	i	s	i
	Mercury (II)	Hg 2+	d	7.3	0.613	0.00550	s	s	i	s	d	s	0.070	11	i	0.005	i	d	i	i	a	i	a
Other	Silver	Ag +	179.6	i	1.65E-5	i	558	18	0.053	s	0.84	234	i	i	d	0.002	i	a	i	i	i	i	i
	Lead (II)	Pb 2+	0.0670	1.08	0.975	0.076	441	s	0.0025	s	0.0044	59.69	a	a	a	i	6.8E-5	i	i	i	i	i	i
	Cadmium	Cd 2+	4.4	120.	115	86.2	142	s	0.09	s	76.7	156	a	a	i	i	2E-9	a	i	i	i	7.7E-3	i