Temperature Dependence of the Water Activity of Saturated Salt Solutions

The relationship between water activity (a_w) and temperature of saturated salt solutions generally follows the following empirical model:

$\ln(aw) = k_1/T - k2$

where:
k_1 and k_2 are constants, different for each salt
T is temperature in Kelvin

Constants k_1 and k_2 may be calculated by regression analysis of experimental data. The following table gives the values for a range of salts based on experimental data previously published by Dr. Labuza.

Salt	k_1	k_2	Mean Relative % Error
$K_2C_2H_3OH$	333.9001	2.6185	1.1647
K_2CO_3	-3.0240	0.8300	0.0046
K_2NO_3	192.0886	0.7183	0.6177
K_2SO_4	52.7544	0.2046	0.0223
KBr	171.2747	0.7828	0.3117
KCl	157.0587	0.6967	0.0289
KI	258.1545	1.2388	0.0095
KOH	2094.4890	9.4977	1.8022
LiBr	620.6358	4.8327	0.1574
LiCl	10.8233	2.2193	0.2040
LiI	982.7329	5.0477	0.9218
$Mg(NO_3)_2$	84.6993	2.2670	0.3413
$MgCl_2$	151.0652	1.6271	0.4059
$(NH_4)_2SO_4$	76.8191	0.4690	0.0337
NaBr	447.8054	2.0575	0.3180
NaCl	23.1092	0.3607	0.1631
NaI	643.0114	3.1407	1.4864
$NaNO_3$	253.3800	1.1493	0.1487
ZnBr2	409.6257	3.9159	1.2005

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°C	Water Activity						
	Cesium Fluoride	Lithium Bromide	Zinc Bromide	Potassium Hydroxide	Sodium Hydroxide	Lithium Chloride	Calcium Bromide
10	0.049 ± 0.016	0.071 ± 0.007	0.085 ± 0.007	0.123 ± 0.014	--	0.113 ± 0.004	0.216 ± 0.005
15	0.043 ± 0.014	0.069 ± 0.006	0.082 ± 0.006	0.107 ± 0.011	0.096 ± 0.028	0.113 ± 0.004	0.202 ± 0.005
20	0.038 ± 0.011	0.066 ± 0.006	0.079 ± 0.005	0.093 ± 0.009	0.089 ± 0.024	0.113 ± 0.003	0.185 ± 0.005
25	0.034 ± 0.009	0.064 ± 0.005	0.078 ± 0.004	0.082 ± 0.007	0.082 ± 0.021	0.113 ± 0.003	0.165 ± 0.002
30	0.030 ± 0.008	0.062 ± 0.005	0.076 ± 0.003	0.074 ± 0.006	0.076 ± 0.017	0.113 ± 0.002	--
35	0.027 ± 0.006	0.060 ± 0.004	0.075 ± 0.003	0.067 ± 0.004	0.069 ± 0.015	0.113 ± 0.002	--
40	0.024 ± 0.005	0.058 ± 0.004	0.075 ± 0.002	0.063 ± 0.004	0.063 ± 0.012	0.112 ± 0.002	--
	Lithium Iodide	Potassium Acetate	Potassium Fluoride	Magnesium Chloride	SodiumIodide	Potassium Carbonate	Magnesium Nitrate
10	0.206 ± 0.003	0.234 ± 0.005	--	0.335 ± 0.002	0.418 ± 0.008	0.431 ± 0.004	0.574 ± 0.003
15	0.196 ± 0.002	0.234 ± 0.003	--	0.333 ± 0.002	0.409 ± 0.007	0.432 ± 0.003	0.559 ± 0.003
20	0.186 ± 0.002	0.231 ± 0.003	--	0.331 ± 0.002	0.397 ± 0.006	0.432 ± 0.003	0.544 ± 0.002
25	0.176 ± 0.001	0.225 ± 0.003	0.308 ± 0.013	0.328 ± 0.002	0.382 ± 0.005	0.432 ± 0.004	0.529 ± 0.002
30	0.166 ± 0.001	0.216 ± 0.005	0.273 ± 0.011	0.324 ± 0.001	0.362 ± 0.004	0.432 ± 0.005	0.514 ± 0.002
35	0.156 ± 0.001	--	0.246 ± 0.009	0.321 ± 0.001	0.347 ± 0.004	--	0.499 ± 0.003
40	0.146 ± 0.001	--	0.227 ± 0.008	0.316 ± 0.001	0.329 ± 0.004	--	0.484 ± 0.004
	Sodium Bromide	Cobalt Chloride	Potassium Iodide	Strontium Chloride	Sodium Nitrate	Sodium Chloride	Ammonium Chloride
10	0.622 ± 0.006	--	0.721 ± 0.003	0.757 ± 0.001	0.775 ± 0.005	0.757 ± 0.002	0.806 ± 0.010
15	0.607 ± 0.005	--	0.710 ± 0.003	0.741 ± 0.001	0.765 ± 0.004	0.756 ± 0.002	0.799 ± 0.006
20	0.591 ± 0.004	--	0.699 ± 0.003	0.725 ± 0.001	0.754 ± 0.004	0.755 ± 0.001	0.792 ± 0.004
25	0.576 ± 0.004	0.649 ± 0.035	0.689 ± 0.002	0.709 ± 0.001	0.743 ± 0.003	0.753 ± 0.001	0.786 ± 0.004
30	0.560 ± 0.004	0.618 ± 0.028	0.679 ± 0.002	0.691 ± 0.001	0.731 ± 0.003	0.751 ± 0.001	0.779 ± 0.006
35	0.546 ± 0.004	0.586 ± 0.022	0.670 ± 0.002	--	0.721 ± 0.003	0.749 ± 0.001	--
40	0.532 ± 0.004	0.555 ± 0.018	0.661 ± 0.002	--	0.710 ± 0.003	0.747 ± 0.001	--
	Potassium Bromide	Ammonium Sulfate	Potassium Chloride	Strontium Nitrate	Potassium Nitrate	Potassium Sulfate	Potassium Chromate
10	0.838 ± 0.002	0.821 ± 0.005	0.868 ± 0.004	0.906 ± 0.004	0.960 ± 0.014	0.982 ± 0.008	--
15	0.826 ± 0.002	0.817 ± 0.004	0.859 ± 0.003	0.887 ± 0.003	0.954 ± 0.010	0.979 ± 0.006	--
20	0.817 ± 0.002	0.813 ± 0.003	0.851 ± 0.003	0.869 ± 0.003	0.946 ± 0.007	0.976 ± 0.005	--
25	0.809 ± 0.002	0.810 ± 0.003	0.843 ± 0.003	0.851 ± 0.004	0.936 ± 0.006	0.973 ± 0.005	0.979 ± 0.005
30	0.803 ± 0.002	0.806 ± 0.003	0.836 ± 0.003	--	0.923 ± 0.006	0.970 ± 0.004	0.971 ± 0.004
35	0.798 ± 0.002	0.803 ± 0.004	0.830 ± 0.003	--	0.908 ± 0.008	0.967 ± 0.004	0.964 ± 0.004
40	0.794 ± 0.002	0.799 ± 0.005	0.823 ± 0.003	--	0.890 ± 0.012	0.964 ± 0.004	0.959 ± 0.004