

Equilibrium constants for hydrolysis and associated equilibria in critical compilations

Nickel(II)

Equilibrium reactions	lgK at infinite dilution and $T = 298 \text{ K}$					
	Feitknecht et al., 1963	Baes and Mesmer, 1976	NIST46	Gamsjäger et al., 2005	Thoenen et al., 2014	Brown and Ekberg, 2016
$\text{Ni}^{2+} + \text{H}_2\text{O} \rightleftharpoons \text{NiOH}^+ + \text{H}^+$		-9.86	-9.9	-9.54 ± 0.14	-9.54 ± 0.14	-9.90 ± 0.03
$\text{Ni}^{2+} + 2 \text{H}_2\text{O} \rightleftharpoons \text{Ni}(\text{OH})_2 + 2 \text{H}^+$		-19	-19		< -18	-21.15 ± 0.06
$\text{Ni}^{2+} + 3 \text{H}_2\text{O} \rightleftharpoons \text{Ni}(\text{OH})_3^- + 3 \text{H}^+$		-30	-30	-29.2 ± 1.7	-29.2 ± 1.7	
$\text{Ni}^{2+} + 4 \text{H}_2\text{O} \rightleftharpoons \text{Ni}(\text{OH})_4^{2-} + 4 \text{H}^+$		< -44				
$2 \text{Ni}^{2+} + \text{H}_2\text{O} \rightleftharpoons \text{Ni}_2(\text{OH})^{3+} + \text{H}^+$		-10.7		-10.6 ± 1.0	-10.6 ± 1.0	-10.6 ± 1.0
$4 \text{Ni}^{2+} + 4 \text{H}_2\text{O} \rightleftharpoons \text{Ni}_4(\text{OH})_4^{4+} + 4 \text{H}^+$		-27.74	-27.7	-27.52 ± 0.15	-27.52 ± 0.15	-27.9 ± 0.6

$\beta\text{-Ni(OH)}_2(\text{s}) + 2 \text{H}^+ \rightleftharpoons \text{Ni}^{2+} + 2 \text{H}_2\text{O}$		10.8			11.02 ± 0.20	10.96 ± 0.20 11.75 ± 0.13 (microcr)
$\text{Ni(OH)}_2(\text{s}) \rightleftharpoons \text{Ni}^{2+} + 2 \text{OH}^-$	-17.2 (inactive)		-17.2	-16.97 ± 0.20 (β) -17.2 ± 1.3 (cr)		
$\text{Ni(OH)}_2(\text{s}) + \text{OH}^- \rightleftharpoons \text{Ni(OH)}_3^-$	-4.2 (inactive)					
$\text{NiO}(\text{cr}) + 2 \text{H}^+ \rightleftharpoons \text{Ni}^{2+} + \text{H}_2\text{O}$				12.38 ± 0.06		12.48 ± 0.15

C.F. Baes and R.E. Mesmer, *The Hydrolysis of Cations*. Wiley, New York, 1976.

P.L. Brown and C. Ekberg, *Hydrolysis of Metal Ions*. Wiley, 2016, pp. 632-649.

W. Feitknecht and P. Schindler, Solubility constants of metal oxides, metal hydroxides and metal hydroxide salts in aqueous solution. *Pure and Applied Chemistry*, 6, 126-199 (1963).

H. Gamsjäger, J. Bugajski, T. Gajda, R.J. Lemire and W. Preis, *Chemical Thermodynamics of Nickel*, *Chemical Thermodynamics, Volume 6*, OECD, Paris, 2005.

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T. Thoenen, W. Hummel, U. Berner and E. Curti, *The PSI/Nagra Chemical Thermodynamic Database 12/07*, 2014.

Distribution diagrams

These diagrams have been computed at two Ni(II) concentrations ($1 \text{ mM} = 1 \times 10^{-3} \text{ mol L}^{-1}$ and $1 \text{ }\mu\text{M} = 1 \times 10^{-6} \text{ mol L}^{-1}$) with the 'best' equilibrium constants above (in green). Calculations assume $T = 298 \text{ K}$ for the limiting case of zero ionic strength (*i.e.*, even neglecting plotted ions).

