

Equilibrium constants for hydrolysis and associated equilibria in critical compilations

Uranium(VI)

Equilibrium reactions	lgK at infinite dilution and $T = 298$ K				
	Baes and Mesmer, 1976	Grenthe et al., 1992	NIST46	Brown and Ekberg, 2016	Grenthe et al., 2020
$\text{UO}_2^{2+} + \text{H}_2\text{O} \rightleftharpoons \text{UO}_2(\text{OH})^+ + \text{H}^+$	-5.8	-5.2 ± 0.3	-5.9 ± 0.1	-5.13 ± 0.04	$-5.2_5 \pm 0.2_4$
$\text{UO}_2^{2+} + 2 \text{H}_2\text{O} \rightleftharpoons \text{UO}_2(\text{OH})_2 + 2 \text{H}^+$		≤ -10.3		$-12.1_5 \pm 0.2_0$	-12.15 ± 0.07
$\text{UO}_2^{2+} + 3 \text{H}_2\text{O} \rightleftharpoons \text{UO}_2(\text{OH})_3^- + 3 \text{H}^+$		-19.2 ± 0.4		$-20.2_5 \pm 0.4_2$	$-20.2_5 \pm 0.4_2$
$\text{UO}_2^{2+} + 4 \text{H}_2\text{O} \rightleftharpoons \text{UO}_2(\text{OH})_4^{2-} + 4 \text{H}^+$		-33 ± 2		$-32.4_0 \pm 0.6_8$	$-32.4_0 \pm 0.6_8$
$2 \text{UO}_2^{2+} + 2 \text{H}_2\text{O} \rightleftharpoons (\text{UO}_2)_2(\text{OH})_2^{2+} + 2 \text{H}^+$	-5.62	-5.62 ± 0.04	-5.58 ± 0.04	-5.68 ± 0.05	-5.62 ± 0.08
$3 \text{UO}_2^{2+} + 5 \text{H}_2\text{O} \rightleftharpoons (\text{UO}_2)_3(\text{OH})_5^+ + 5 \text{H}^+$	-15.63	$-15.5_5 \pm 0.1_2$	-15.6	$-15.7_5 \pm 0.1_2$	$-15.5_5 \pm 0.1_2$

$3 \text{UO}_2^{2+} + 4 \text{H}_2\text{O} \rightleftharpoons (\text{UO}_2)_3(\text{OH})_4^{2+} + 4 \text{H}^+$	(-11.75)	-11.9 ± 0.3		-11.78 ± 0.05	-11.9 ± 0.3
$3 \text{UO}_2^{2+} + 7 \text{H}_2\text{O} \rightleftharpoons (\text{UO}_2)_3(\text{OH})_7^- + 7 \text{H}^+$		-31 ± 2.0		-32.2 ± 0.8	-32.2 ± 0.8
$4 \text{UO}_2^{2+} + 7 \text{H}_2\text{O} \rightleftharpoons (\text{UO}_2)_4(\text{OH})_7^+ + 7 \text{H}^+$		-21.9 ± 1.0		-22.1 ± 0.2	-21.9 ± 1.0
$2 \text{UO}_2^{2+} + \text{H}_2\text{O} \rightleftharpoons (\text{UO}_2)_2(\text{OH})_3^+ + \text{H}^+$		-2.7 ± 1.0			-2.7 ± 1.0
$\text{UO}_2(\text{OH})_2(\text{s}) + 2\text{H}^+ \rightleftharpoons \text{UO}_2^{2+} + 2 \text{H}_2\text{O}$	5.6		6.0	4.81 ± 0.20	
$\text{UO}_3 \cdot 2\text{H}_2\text{O}(\text{cr}) + 2\text{H}^+ \rightleftharpoons \text{UO}_2^{2+} + 3 \text{H}_2\text{O}$					5.350 ± 0.130

C.F. Baes and R.E. Mesmer, *The Hydrolysis of Cations*. Wiley, New York, 1976, p. 182.

P.L. Brown and C. Ekberg, *Hydrolysis of Metal Ions*. Wiley, 2016, pp. 350–379.

I. Grenthe, J. Fuger, R.J.M. Konings, R.J. Lemire, A.B. Muller, C. Nguyen-Trung and H. Wanner, *Chemical Thermodynamics of Uranium, Chemical Vol 1*, OECD Publishing, Paris, 1992.

I. Grenthe, X. Gaona, A.V. Plyasunov, L. Rao, W.H. Runde, B. Grambow, R.J.M. Konings, A.L. Smith and E.E. Moore, *Second Update on the Chemical Thermodynamics of Uranium, Neptunium, Plutonium, Americium and Technetium*, OECD Publishing, Paris, 2020.

NIST46, NIST Critically Selected Stability Constants of Metal Complexes: Version 8.0. Available at: www.nist.gov/srd/nist46

Distribution diagrams

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

