

## Equilibrium constants for hydrolysis and associated equilibria in critical compilations

# Plutonium(IV)

Equilibrium reactions	lgK at infinite dilution and $T = 298\text{ K}$			
	Baes and Mesmer, 1976	NIST46	Brown and Ekberg, 2016	Grenthe et al., 2020
$\text{Pu}^{4+} + \text{H}_2\text{O} \rightleftharpoons \text{PuOH}^{3+} + \text{H}^+$	-0.5	-0.5	$-0.7 \pm 0.1$	$0.6 \pm 0.2$
$\text{Pu}^{4+} + 2 \text{H}_2\text{O} \rightleftharpoons \text{Pu}(\text{OH})_2^{2+} + 2 \text{H}^+$	(-2.3)			$0.6 \pm 0.3$
$\text{Pu}^{4+} + 3 \text{H}_2\text{O} \rightleftharpoons \text{Pu}(\text{OH})_3^+ + 3 \text{H}^+$	(-5.3)			$-2.3 \pm 0.4$
$\text{Pu}^{4+} + 4 \text{H}_2\text{O} \rightleftharpoons \text{Pu}(\text{OH})_4 + 4 \text{H}^+$	-9.5		$-12.5 \pm 0.7$	$-8.5 \pm 0.5$
$\text{Pu}^{4+} + 4 \text{OH}^- \rightleftharpoons \text{PuO}_2(\text{am, hyd}) + 2 \text{H}_2\text{O}$	49.5		$47.9 \pm 0.4$ (0w) $53.8 \pm 0.5$ (1w)	$58.3 \pm 0.5$

C.F. Baes and R.E. Mesmer, *The Hydrolysis of Cations*. Wiley, New York, 1976, pp. 187–189.

P.L. Brown and C. Ekberg, *Hydrolysis of Metal Ions*. Wiley, 2016, pp. 397–401.

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](http://www.nist.gov/srd/nist46)

# Distribution diagrams

These diagrams have been computed at two Pu(IV) concentrations (1 mM =  $1 \times 10^{-3}$  mol L<sup>-1</sup> and 1  $\mu$ M =  $1 \times 10^{-6}$  mol L<sup>-1</sup>) 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).

