

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

# Hafnium

Equilibrium reactions	lgK at infinite dilution and $T = 298$ K	
	Baes and Mesmer, 1976	Brown and Ekberg, 2016
$\text{Hf}^{4+} + \text{H}_2\text{O} \rightleftharpoons \text{HfOH}^{3+} + \text{H}^+$	-0.25	$-0.26 \pm 0.10$
$\text{Hf}^{4+} + 2 \text{H}_2\text{O} \rightleftharpoons \text{Hf}(\text{OH})_2^{2+} + 2 \text{H}^+$	(-2.4)	
$\text{Hf}^{4+} + 3 \text{H}_2\text{O} \rightleftharpoons \text{Hf}(\text{OH})_3^+ + 3 \text{H}^+$	(-6.0)	
$\text{Hf}^{4+} + 4 \text{H}_2\text{O} \rightleftharpoons \text{Hf}(\text{OH})_4 + 4 \text{H}^+$	-10.7*	$-3.75 \pm 0.34^*$
$\text{Hf}^{4+} + 5 \text{H}_2\text{O} \rightleftharpoons \text{Hf}(\text{OH})_5^- + 5 \text{H}^+$	-17.2	
$3 \text{Hf}^{4+} + 4 \text{H}_2\text{O} \rightleftharpoons \text{Hf}_3(\text{OH})_4^{8+} + 4 \text{H}^+$		$0.55 \pm 0.30$
$4 \text{Hf}^{4+} + 8 \text{H}_2\text{O} \rightleftharpoons \text{Hf}_4(\text{OH})_8^{8+} + 8 \text{H}^+$		$6.00 \pm 0.30$
$\text{HfO}_2(\text{s}) + 4 \text{H}^+ \rightleftharpoons \text{Hf}^{4+} + 2 \text{H}_2\text{O}$	-1.2*	$-5.56 \pm 0.15^*$
$\text{HfO}_2(\text{am}) + 4 \text{H}^+ \rightleftharpoons \text{Hf}^{4+} + 2 \text{H}_2\text{O}$		$-3.11 \pm 0.20$

\*Errors in compilations concerning equilibrium and/or data elaboration. Data not recommended. Strongly suggested to refer to the original papers.

C.F. Baes and R.E. Mesmer, *The Hydrolysis of Cations*. Wiley, New York, 1976, p. 158.

P.L. Brown and C. Ekberg, *Hydrolysis of Metal Ions*. Wiley, 2016, pp. 460-463.

# Distribution diagrams

These diagrams have been computed at two Hf 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).

