

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

# Hafnium

Equilibrium reactions	lgK at infinite dilution and $T = 298 \text{ K}$	
	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 ( $1 \text{ mM} = 1 \times 10^{-3} \text{ mol L}^{-1}$  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).

