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Equilibrium constants for hydrolysis and associated equilibria in critical compilations

Bismuth

Equilibrium reactions	lg*K* at infinite dilution and *T* = 298 K				
	Baes and Mesmer, 1976	Lothenbach et al., 1999	NIST46	Kitamura et al., 2010	Brown and Ekberg, 2016
$Bi^{3+} + H_2O \rightleftharpoons BiOH^{2+} + H^+$	–1.09	–0.92	–1.1	–0.920	–0.92 ± 0.15
$Bi^{3+} + 2\ H_2O \rightleftharpoons Bi(OH)_2^{+} + 2\ H^+$	(–4)	–2.56	–4.5	–2.560 ± 1.000	–2.59 ± 0.26
$Bi^{3+} + 3\ H_2O \rightleftharpoons Bi(OH)_3 + 3\ H^+$	–8.86	–5.31	–9.0	–8.940 ± 0.500	–8.78 ± 0.20
$Bi^{3+} + 4\ H_2O \rightleftharpoons Bi(OH)_4^{-} + 4\ H^+$	–21.8	–18.71	–21.2	–21.660 ± 0.870	–22.06 ± 0.14
$3\ Bi^{3+} + 4\ H_2O \rightleftharpoons Bi_3(OH)_4^{5+} + 4\ H^+$		–0.80		–0.800	
$6\ Bi^{3+} + 12\ H_2O \rightleftharpoons Bi_6(OH)_{12}^{6+} + 12\ H^+$		1.34		1.340	0.98 ± 0.13

$9\ Bi^{3+} + 20\ H_2O = Bi_9(OH)_{20}^{7+} + 20\ H^+$		–1.36		–1.360	
$9\ Bi^{3+} + 21\ H_2O = Bi_9(OH)_{21}^{6+} + 21\ H^+$		–3.25		–3.250	
$9\ Bi^{3+} + 22\ H_2O = Bi_9(OH)_{22}^{5+} + 22\ H^+$		–4.86		–4.860	
$Bi(OH)_3(am) + 3\ H^+ = Bi^{3+} + 3\ H_2O$				31.501 ± 0.927	
$a\text{-}Bi_2O_3(cr) + 6\ H^+ = 2\ Bi^{3+} + 3\ H_2O$		0.76			
$BiO_{1.5}(s, \alpha) + 3\ H^+ = Bi^{3+} + 1.5\ H_2O$	3.46			31.501 ± 0.927	2.88 ± 0.64

C.F. Baes and R.E. Mesmer, The Hydrolysis of Cations. Wiley, New York, 1976, p. 383.

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Distribution diagrams

These diagrams have been computed at two Bi concentrations (1 mM = $1x10^{-3}$ mol L^{-1} and 1 µM = $1x10^{-6}$ 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).