Thorium

Equilibrium reactions	lg$K$ at infinite dilution and T = 298 K			
	Baes and Mesmer, 1976	Rand et al., 2008	Thoenen et al, 2014	Brown and Ekberg, 2016
$Th^{4+} + H_2O \rightleftharpoons ThOH^{3+} + H^+$	−3.20	−2.5 ± 0.5	−2.5 ± 0.5	−2.5 ± 0.5
$Th^{4+} + 2H_2O \rightleftharpoons Th(OH)_2^{2+} + 2H^+$	−6.93	−6.2 ± 0.5	−6.2 ± 0.5	−6.2 ± 0.5
$Th^{4+} + 3H_2O \rightleftharpoons Th(OH)_3^+ + 3H^+$	< −11.7			
$Th^{4+} + 4H_2O \rightleftharpoons Th(OH)_4 + 4H^+$	−15.9	−17.4 ± 0.7	−17.4 ± 0.7	−17.4 ± 0.7
$2Th^{4+} + 2H_2O \rightleftharpoons Th_2(OH)_2^{6+} + 2H^+$	−6.14	−5.9 ± 0.5	−5.9 ± 0.5	−5.9 ± 0.5
$2Th^{4+} + 3H_2O \rightleftharpoons Th_2(OH)_3^{5+} + 3H^+$		−6.8 ± 0.2	−6.8 ± 0.2	−6.8 ± 0.2
$4Th^{4+} + 8H_2O \rightleftharpoons Th_4(OH)_8^{8+} + 8H^+$	−21.1	−20.4 ± 0.4	−20.4 ± 0.4	−20.4 ± 0.4
$4Th^{4+} + 12H_2O \rightleftharpoons Th_4(OH)_{12}^{4+} + 12H^+$		−26.6 ± 0.2	−26.6 ± 0.2	−26.6 ± 0.2
$6Th^{4+} + 15H_2O(l) \rightleftharpoons Th_6(OH)_{15}^{9+} + 15H^+$	−36.76	−36.8 ± 1.5	−36.8 ± 1.5	−36.8 ± 1.5
$6Th^{4+} + 14H_2O(l) \rightleftharpoons Th_6(OH)_{14}^{10+} + 14H^+$		−36.8 ± 1.2	−36.8 ± 1.2	−36.8 ± 1.2
$ThO_2(c) + 4H^+ \rightleftharpoons Th^{4+} + 2H_2O$	6.3			
$ThO_2(am) + 4H^+ \rightleftharpoons Th^{4+} + 2H_2O$				8.8 ± 1.0
$ThO_2(am,hyd,fresh) + 4H^+ \rightleftharpoons Th^{4+} + 2H_2O$			9.3 ± 0.9	

$ThO_2(am,hyd,aged) + 4H^+ \rightleftharpoons Th^{4+} + 2H_2O$			8.5 ± 0.9	
$Th^{4+} + 4OH^- \rightleftharpoons ThO_2(am,hyd,fresh) + 2H_2O$		46.7 ± 0.9		
$Th^{4+} + 4OH^- \rightleftharpoons ThO_2(am,hyd,aged) + 2H_2O$		47.5 ± 0.9		

C.F. Baes and R.E. Mesmer, The Hydrolysis of Cations. Wiley, New York, 1976, p. 168.

P.L. Brown and C. Ekberg, Hydrolysis of Metal Ions. Wiley, 2016, pp. 462–498.

M. Rand, J. Fuger, I. Grenthe, V. Neck and D. Rai, Chemical Thermodynamics of Thorium, OECD Pub., 2008.

T. Thoenen, W. Hummel, U. Berner and E. Curti, The PSI/Nagra Chemical Thermodynamic Database 12/07, Villigen: Paul Scherrer Institute PSI, 2014 pp. 259–263.

Contributors: Clemente Bretti, Elvira Bura Nakić, Montserrat Filella, Josep Galceran, Sofia Gama, Elżbieta Gumienna- Kontecka, Lucija Knežević, Gabriele Lando, Přemysl Lubal, Demetrio Milea, Andrzej Mular, Bartosz Orzeł, Michaela Rendošová, Matteo Savastano, Vladimir Sladkov, Kamila Stokowa-Sołtys, Yuliya Toporivska, Zuzana Vargová, Emanuele Zanda, Veronika Zinovyeva

Distribution diagrams

These diagrams have been computed at two Th(IV) 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).