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Source: Compilation COST Action 1802

Equilibrium constants for hydrolysis and associated equilibria in critical compilations

Lead(II)

Equilibrium reactions	lg*K* at infinite dilution and *T* = 298 K				
	Baes and Mesmer, 1976	NIST46	Powell et al., 2009	Brown and Ekberg, 2016	Cataldo et al., 2018
$Pb^{2+} + H_2O \rightleftharpoons PbOH^+ + H^+$	–7.71	–7.6	–7.46 ± 0.06	–7.49 ± 0.13	–6.47± 0.03
$Pb^{2+} + 2\ H_2O \rightleftharpoons Pb(OH)_2 + 2\ H^+$	–17.12	–17.1	–16.94 ± 0.09	–16.99 ± 0.06	–16.12 ± 0.01
$Pb^{2+} + 3\ H_2O \rightleftharpoons Pb(OH)_3^- + 3\ H^+$	–28.06	–28.1	–28.03± 0.06	–27.94 ± 0.21	–28.4 ± 0.1
$Pb^{2+} + 4\ H_2O \rightleftharpoons Pb(OH)_4^{2-} + 4\ H^+$			–40.8		
$2\ Pb^{2+} + H_2O \rightleftharpoons Pb_2(OH)^{3+} + H^+$	–6.36	–6.4	–7.28± 0.09	–6.73 ± 0.31	
$3\ Pb^{2+} + 4\ H_2O \rightleftharpoons Pb_3(OH)_4^{2+} + 4\ H^+$	–23.88	–23.9	–23.01 ± 0.07	–23.43 ± 0.10	

$3\ Pb^{2+} + 5\ H_2O \rightleftharpoons Pb_3(OH)_5^{+} + 5\ H^{+}$				–31.11 ± 0.10	
$4\ Pb^{2+} + 4\ H_2O \rightleftharpoons Pb_4(OH)_4^{4+} + 4\ H^{+}$	–20.88	–20.9	–20.57± 0.06	–20.71 ± 0.18	
$6\ Pb^{2+} + 8\ H_2O \rightleftharpoons Pb_6(OH)_8^{4+} + 8\ H^{+}$	–43.61	–43.6	–42.89± 0.07	–43.27 ± 0.47	
$PbO(s) + 2\ H^{+} \rightleftharpoons Pb^{2+} + H_2O$			12.62 (red) 12.90 (yellow)		
$PbO(s) + H_2O \rightleftharpoons Pb^{2+} + 2\ OH^{-}$	–15.28 (red)	-15.3	–15.3 (red) –15.1 (yellow)	–15.37 ± 0.04 (red) –15.1 ± 0.08 (yellow)	
$Pb_2O(OH)_{2(s)} + H_2O \rightleftharpoons 2\ Pb^{2+} + 4\ OH^{-}$			–14.9		
$PbO_{(s)} + H_2O \rightleftharpoons Pb(OH)_2$			–4.4 (red) –4.2 (yellow)		
$Pb_2O(OH)_{2(s)} + H_2O \rightleftharpoons 2\ Pb(OH)_2$			–4.0		
$PbO_{(s)} + 2\ H_2O \rightleftharpoons Pb(OH)_3^{-} + H^{+}$			–1.4 (red) –1.2 (yellow)		

$Pb_2O(OH)_2(s) + 2\ H_2O \rightleftharpoons 2\ Pb(OH)_3^- + 2\ H^+$			–1.0		

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S. Cataldo, G. Lando, D. Milea, S. Orecchio, A. Pettignano, S. Sammartano, A novel thermodynamic approach for the complexation study of toxic metal cations by a landfill leachate. New J. Chem., 42, 7640–7648 (2018).

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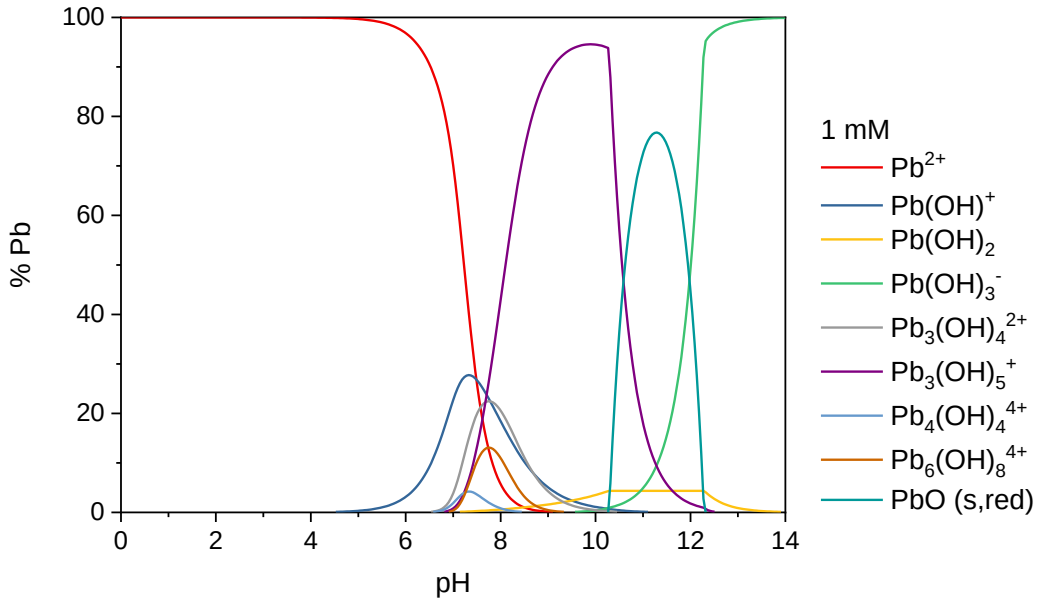
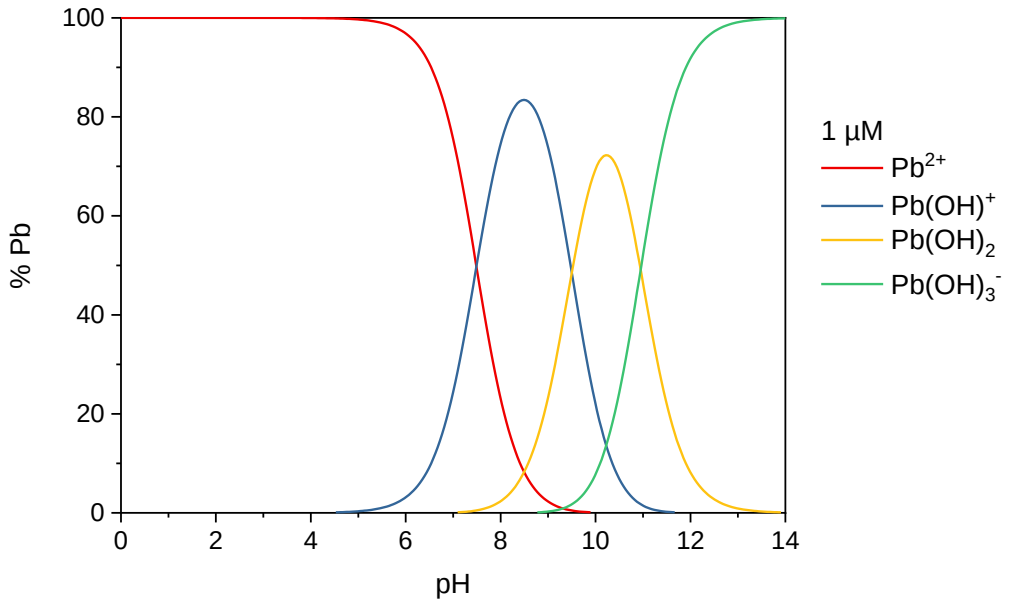
Distribution diagrams

These diagrams have been computed at two Pb(II) 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).





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Lead(IV)

Equilibrium reactions	lg*K* at infinite dilution and *T* = 298 K
	Feitknecht and Schindler, 1963
$\beta\text{-}PbO_2 + 2\ H_2O \rightleftharpoons Pb^{4+} + 4\ OH^-$	–64
$\beta\text{-}PbO_2 + 2\ H_2O + 2\ OH^- \rightleftharpoons Pb(OH)_6^{2-}$	–4.5

W. Feitknecht and P. Schindler, Solubility constants of metal oxides, metal hydroxides and metal hydroxide salts in aqueous solution. Pure Appl. Chem., 6, 125–206 (1963).

Distribution diagrams

These diagrams have been computed at two Pb(IV) concentrations (1 mM = $1x10^{-3}$ mol L^{-1} and 1 μM = $1x10^{-6}$ mol L^{-1}) with the 'best' equilibrium constants above. Calculations assume T = 298 K for the limiting case of zero ionic strength (*i.e.*, even neglecting plotted ions).