Iron(II)

Equilibrium reactions	lg*K* at infinite dilution and *T* = 298 K		
	Baes and Mesmer, 1976	Lemire et al., 2013	Brown and Ekberg, 2016
$Fe^{2+} + H_2O \rightleftharpoons FeOH^+ + H^+$	−9.5	−9.1 ± 0.4	−9.43 ± 0.10
$Fe^{2+} + 2\ H_2O \rightleftharpoons Fe(OH)_2 + 2\ H^+$	−20.6	−21.2±1.1	−20.52 ± 0.08
$Fe^{2+} + 3\ H_2O \rightleftharpoons Fe(OH)_3^- + 3\ H^+$	−31	−34.3±0.2	−32.68 ± 0.15
$Fe^{2+} + 4\ H_2O \rightleftharpoons Fe(OH)_4^{2} + 4\ H^+$	−46		
$Fe(OH)_2(s) + 2\ H^+ \rightleftharpoons Fe^{2+} + 2\ H_2O$	12.85	12.5 ± 0.02	12.27 ± 0.88

C.F. Baes and R.E. Mesmer, The Hydrolysis of Cations. Wiley, New York, 1976, p. 235.

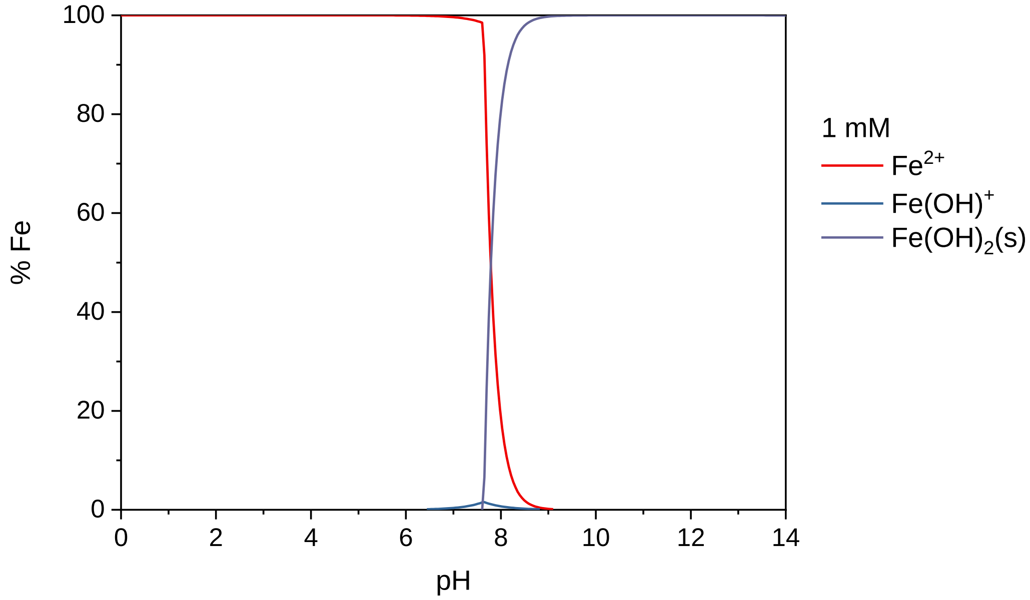
P.L. Brown and C. Ekberg, Hydrolysis of Metal Ions. Wiley, 2016, pp. 573−585.

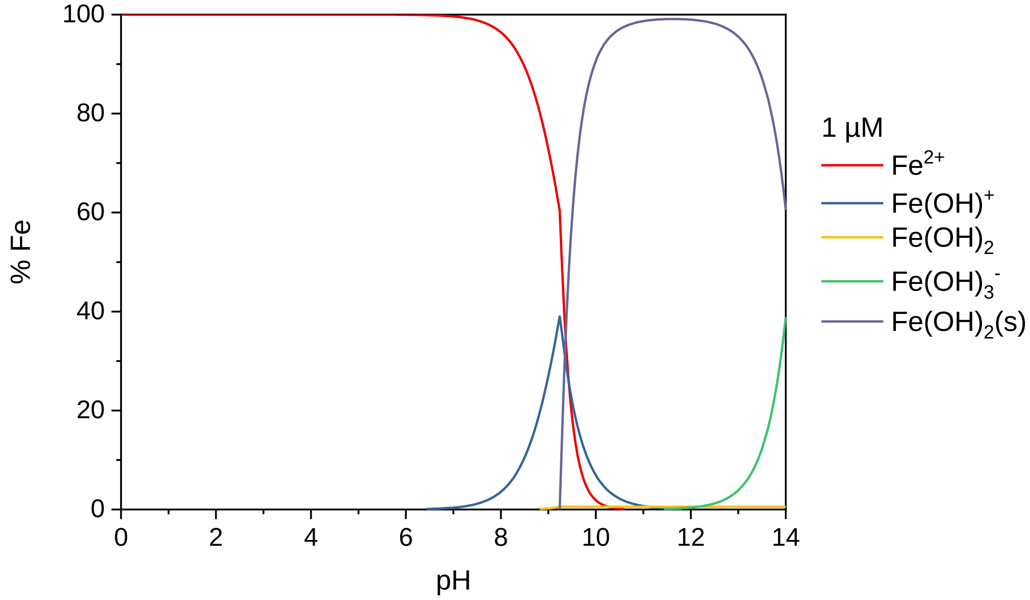
R.J. Lemire, U. Berner, C. Musikas, D.A. Palmer, P.Taylor, O. Tochiyama, Chemical Thermodynamics Volume 13a in the OECD Nuclear Energy Agency (NEA) Chemical Thermodynamics series, Chemical Thermodynamics of Iron, Part 1, 2013.

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 Fe(II) concentrations (1 mM = 1×10^{-3} mol L^{-1} and 1 μM = 1×10^{-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).





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

Iron(III)

Equilibrium reactions	lg*K* at infinite dilution and *T* = 298 K		
	Baes and Mesmer, 1976	Lemire et al., 2013	Brown and Ekberg, 2016
$Fe^{3+} + H_2O \rightleftharpoons Fe(OH)^{2+} + H+$	−2.19	−2.15 ± 0.07	−2.20 ± 0.02
$Fe^{3+} + 2\ H_2O \rightleftharpoons Fe(OH)_2^+ + 2\ H^+$	−5.67	−4.8 ± 0.4	−5.71 ± 0.10
$Fe^{3+} + 3\ H_2O \rightleftharpoons Fe(OH)_3 + 3\ H^+$	<−12	<−14	−12.42 ± 0.20
$Fe^{3+} + 4\ H_2O \rightleftharpoons Fe(OH)_4^- + 4\ H^+$	−21.6	*−21.5 ± 0.5*	−21.60 ± 0.23
$2\ Fe^{3+} + 2\ H_2O \rightleftharpoons Fe_2(OH)_2^{4+} + 2\ H^+$	−2.95	−2.91 ± 0.07	−2.91 ± 0.07
$3\ Fe^{3+} + 4\ H_2O \rightleftharpoons Fe_3(OH)_4^{5+} + 4\ H^+$	−6.3		−6.3 ± 0.1
$Fe(OH)_3(s) + 3\ H^+ \rightleftharpoons Fe^{3+} + 3\ H_2O$ 2-line ferrihydrite	2.5	3.5	3.50 ± 0.20
$Fe(OH)_3(s) \rightleftharpoons Fe^{3+} + 3\ OH^-$ 6-line ferrihydrite		−38.97 ± 0.64	
$\alpha\text{-}FeOOH(s) + 3\ H^+ \rightleftharpoons Fe^{3+} + 2\ H_2O$ goethite	0.5		0.33 ± 0.10
$\alpha\text{-}FeOOH + H_2O \rightleftharpoons Fe^{3+} + 3\ OH^-$ goethite		−41.83 ± 0.37	
$0.5\ \alpha\text{-}Fe_2O_3(s) + 3\ H^+ \rightleftharpoons Fe^{3+} + 1.5\ H_2O$ hematite			0.36 ± 0.40

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

0.5 α-Fe_2O_3 + 1.5 H_2O ⇌ Fe^{3+} + 3 OH^- hematite		−42.05 ± 0.26	
0.5 γ-Fe_2O_3(s) + 3 H^+ ⇌ Fe^{3+} + 1.5 H_2O maghemite			1.61 ± 0.61
0.5 γ-Fe_2O_3 + 1.5 H_2O ⇌ Fe^{3+} + 3 OH^- maghemite		−40.59 ± 0.29	
α-FeOOH(s)+ 3 H^+ ⇌ Fe^{3+} + 2 H_2O lepidocrocite			1.85 ± 0.37
γ-FeOOH + H_2O ⇌ Fe^{3+} + 3 OH^- lepidocrocite		−40.13 ± 0.37	
$Fe(OH)_3$(s) + 3 H^+ ⇌ Fe^{3+} + 3 H_2O magnetite			−12.26 ± 0.26

C.F. Baes and R.E. Mesmer, The Hydrolysis of Cations. Wiley, New York, 1976, p. 235.

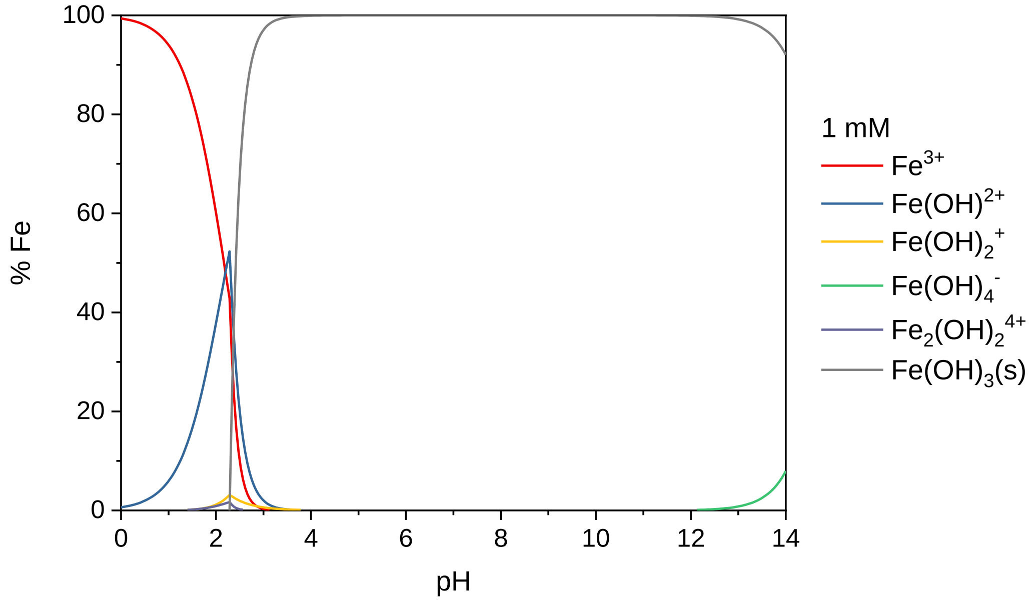
P.L. Brown and C. Ekberg, Hydrolysis of Metal Ions. Wiley, 2016, pp. 585–620.

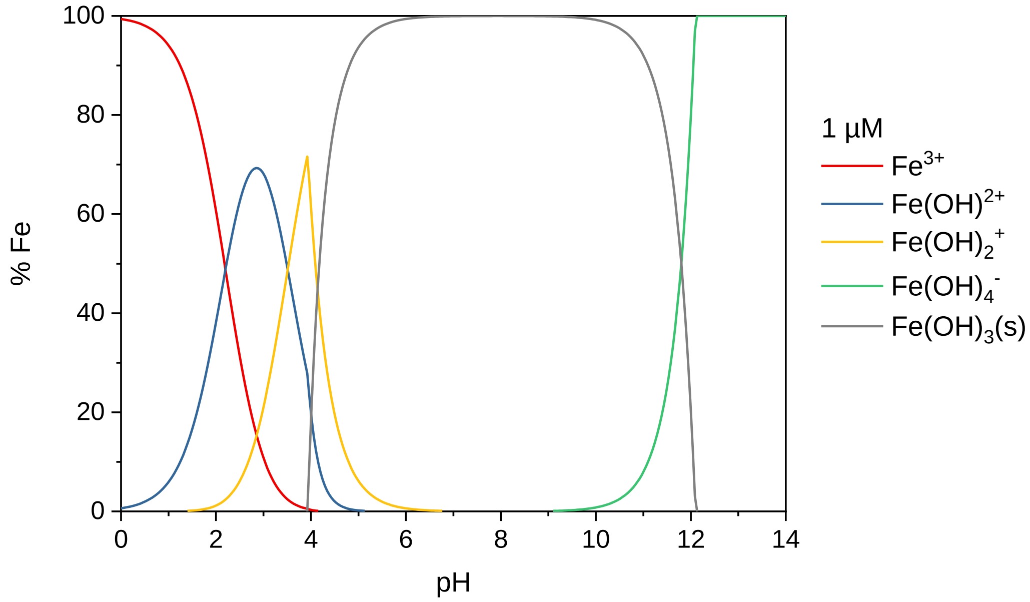
R.J. Lemire, U. Berner, C. Musikas, D.A. Palmer, P.Taylor, O. Tochiyama, Chemical Thermodynamics Volume 13a in the OECD Nuclear Energy Agency (NEA) Chemical Thermodynamics series, Chemical Thermodynamics of Iron, Part 1, 2013.

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 Fe(III) 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).





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