

Formation Constants of Complex Ions

Complex Ion Equilibrium	$K_{\text{formation}}$
Halide complexes	
$\text{Al}^{3+} + 6 \text{F}^- \leftrightarrow [\text{AlF}_6]^{3-}$	2.5×10^4
$\text{Al}^{3+} + 4 \text{F}^- \leftrightarrow [\text{AlF}_4]^-$	2.0×10^8
$\text{Be}^{2+} + 4 \text{F}^- \leftrightarrow [\text{BeF}_4]^{2-}$	1.3×10^{13}
$\text{Sn}^{4+} + 6 \text{F}^- \leftrightarrow [\text{SnF}_6]^{2-}$	1.0×10^{25}
$\text{Cu}^+ + 2 \text{Cl}^- \leftrightarrow [\text{CuCl}_2]^-$	3.0×10^5
$\text{Ag}^+ + 2 \text{Cl}^- \leftrightarrow [\text{AgCl}_2]^-$	1.8×10^5
$\text{Pb}^{2+} + 4 \text{Cl}^- \leftrightarrow [\text{PbCl}_4]^{2-}$	2.5×10^{15}
$\text{Zn}^{2+} + 4 \text{Cl}^- \leftrightarrow [\text{ZnCl}_4]^{2-}$	1.6
$\text{Hg}^{2+} + 4 \text{Cl}^- \leftrightarrow [\text{HgCl}_4]^{2-}$	5.0×10^{15}
$\text{Cu}^+ + 2 \text{Br}^- \leftrightarrow [\text{CuBr}_2]^-$	8.0×10^5
$\text{Ag}^+ + 2 \text{Br}^- \leftrightarrow [\text{AgBr}_2]^-$	1.0×10^{11}
$\text{Hg}^{2+} + 4 \text{Br}^- \leftrightarrow [\text{HgBr}_4]^{2-}$	3.0×10^4
$\text{Cu}^+ + 2 \text{I}^- \leftrightarrow [\text{CuI}_2]^-$	8.0×10^8
$\text{Ag}^+ + 2 \text{I}^- \leftrightarrow [\text{AgI}_2]^-$	1.0×10^{11}
$\text{Pb}^{2+} + 4 \text{I}^- \leftrightarrow [\text{PbI}_4]^{2-}$	3.0×10^4
$\text{Hg}^{2+} + 4 \text{I}^- \leftrightarrow [\text{HgI}_4]^{2-}$	1.9×10^{30}
Ammonia complexes	
$\text{Ag}^+ + 2 \text{NH}_3 \leftrightarrow [\text{Ag}(\text{NH}_3)_2]^+$	1.6×10^7
$\text{Zn}^{2+} + 4 \text{NH}_3 \leftrightarrow [\text{Zn}(\text{NH}_3)_4]^{2+}$	7.8×10^8
$\text{Cu}^{2+} + 4 \text{NH}_3 \leftrightarrow [\text{Cu}(\text{NH}_3)_4]^{2+}$	1.1×10^{13}
$\text{Hg}^{2+} + 4 \text{NH}_3 \leftrightarrow [\text{Hg}(\text{NH}_3)_4]^{2+}$	1.8×10^{19}
$\text{Co}^{2+} + 6 \text{NH}_3 \leftrightarrow [\text{Co}(\text{NH}_3)_6]^{2+}$	5.0×10^4
$\text{Co}^{3+} + 6 \text{NH}_3 \leftrightarrow [\text{Co}(\text{NH}_3)_6]^{3+}$	4.6×10^{33}
$\text{Cd}^{2+} + 6 \text{NH}_3 \leftrightarrow [\text{Cd}(\text{NH}_3)_6]^{2+}$	2.6×10^5
$\text{Ni}^{2+} + 6 \text{NH}_3 \leftrightarrow [\text{Ni}(\text{NH}_3)_6]^{2+}$	2.0×10^8
Cyanide complexes	
$\text{Fe}^{2+} + 6 \text{CN}^- \leftrightarrow [\text{Fe}(\text{CN})_6]^{4-}$	1.0×10^{24}
$\text{Fe}^{3+} + 6 \text{CN}^- \leftrightarrow [\text{Fe}(\text{CN})_6]^{3-}$	1.0×10^{31}
$\text{Ag}^+ + 2 \text{CN}^- \leftrightarrow [\text{Ag}(\text{CN})_2]^-$	5.3×10^{18}
$\text{Cu}^+ + 2 \text{CN}^- \leftrightarrow [\text{Cu}(\text{CN})_2]^-$	1.0×10^{16}
$\text{Cd}^{2+} + 4 \text{CN}^- \leftrightarrow [\text{Cd}(\text{CN})_4]^{2-}$	7.7×10^{16}
$\text{Au}^+ + 2 \text{CN}^- \leftrightarrow [\text{Au}(\text{CN})_2]^-$	2.0×10^{38}
Complexes with other monodentate ligands	
$\text{Ag}^+ + 2 \text{CH}_3\text{NH}_2 \leftrightarrow [\text{Ag}(\text{CH}_3\text{NH}_2)_2]^+$	7.8×10^6
$\text{Cd}^{2+} + 4 \text{SCN}^- \leftrightarrow [\text{Cd}(\text{SCN})_4]^{2-}$	1.0×10^3

$\text{Cu}^{2+} + 2 \text{SCN}^- \leftrightarrow [\text{Cu}(\text{SCN})_2]^0$	5.6×10^3
$\text{Fe}^{3+} + 3 \text{SCN}^- \leftrightarrow [\text{Fe}(\text{SCN})_3]^0$	2.0×10^6
$\text{Hg}^{2+} + 4 \text{SCN}^- \leftrightarrow [\text{Hg}(\text{SCN})_4]^{2-}$	5.0×10^{21}
$\text{Cu}^{2+} + 4 \text{OH}^- \leftrightarrow [\text{Cu}(\text{OH})_4]^{2-}$	1.3×10^{16}
$\text{Zn}^{2+} + 4 \text{OH}^- \leftrightarrow [\text{Zn}(\text{OH})_4]^{2-}$	2.0×10^{20}

**Complexes with bidentate ligands
(en = ethylenediamine)**

$\text{Mn}^{2+} + 3 \text{en} \leftrightarrow [\text{Mn}(\text{en})_3]^{2+}$	6.5×10^5
$\text{Fe}^{2+} + 3 \text{en} \leftrightarrow [\text{Fe}(\text{en})_3]^{2+}$	5.2×10^9
$\text{Co}^{2+} + 3 \text{en} \leftrightarrow [\text{Co}(\text{en})_3]^{2+}$	1.3×10^{14}
$\text{Co}^{3+} + 3 \text{en} \leftrightarrow [\text{Co}(\text{en})_3]^{3+}$	4.8×10^{48}
$\text{Ni}^{2+} + 3 \text{en} \leftrightarrow [\text{Ni}(\text{en})_3]^{2+}$	4.1×10^{17}
$\text{Cu}^{2+} + 2 \text{en} \leftrightarrow [\text{Cu}(\text{en})_2]^{2+}$	3.5×10^{19}
$\text{Co}^{2+} + 3 \text{C}_2\text{O}_4^{2-} \leftrightarrow [\text{Co}(\text{C}_2\text{O}_4)_3]^{4-}$	4.5×10^6
$\text{Fe}^{3+} + 3 \text{C}_2\text{O}_4^{2-} \leftrightarrow [\text{Fe}(\text{C}_2\text{O}_4)_3]^{3-}$	3.3×10^{20}