

Calculation of free cyanide for solutions of AgCN, KAg(CN)₂, KAu(CN)₂, K[Au(CN)₄] (Intertek proposal)

Case 1: AgCN



$$K_{\text{sol}} : [\text{Ag}^+] \cdot [\text{Ag}(\text{CN})_2^-] = 2.2 \cdot 10^{-12} \quad \text{mol}^2/\text{l}^2 \quad \text{Eq. (1)}$$

therefore:

$$[\text{Ag}(\text{CN})_2^-] = 1,48 \cdot 10^{-6} \quad \text{mol/l}$$

formation of free cyanide



$$K_{\text{diss}} : [\text{Ag}^+] \cdot [\text{CN}^-]^2 / [\text{Ag}(\text{CN})_2^-] = 1,8 \cdot 10^{-19} \quad \text{Eq. (2)}$$

$$[\text{CN}^-]: 4,24 \cdot 10^{-10} \quad \text{mol/l}$$

Equates

$$0,011 \mu\text{g/l}$$

Case 2: $\text{KAg}(\text{CN})_2$

dissoziation process see Eq. (2)

concentration of $[\text{Ag}(\text{CN})_2]^-$ → concentration of free cyanide

10 mg/l	→	0.605 $\mu\text{g/l}$
1 mg/l	→	0.281 $\mu\text{g/l}$
0.1 mg/l	→	0.130 $\mu\text{g/l}$
0.01 mg/l	→	0.061 $\mu\text{g/l}$

Case 3: $\text{KAu}(\text{CN})_2$

$[\text{Au}(\text{CN})_2]^- \rightarrow \text{Au}^+ + 2\text{CN}^-$ dissoziation process

$$K_{\text{diss}} : [\text{Au}^+] \cdot [\text{CN}^-]^2 / [\text{Au}(\text{CN})_2^-] = 5,0 \cdot 10^{-39} \quad \text{Eq. (3)}$$

concentration of $[\text{Au}(\text{CN})_2]^-$ → concentration of free cyanide

10 mg/l	→	0.152 pg/l
1 mg/l	→	0.071 pg/l
0.1 mg/l	→	0.033 pg/l
0.01 mg/l	→	0.015 pg/l

Case 4: $\text{K}[\text{Au}(\text{CN})_4]$



$$K_{\text{diss}} : [\text{Au}^+] \cdot [\text{CN}^-]^4 / [\text{Au}(\text{CN})_4^-] = 1,0 \cdot 10^{-56} \quad \text{Eq. (4)}$$

concentration of $[\text{Au}(\text{CN})_4]^-$ → concentration of free cyanide

10 mg/l	→	0.241 ng/l
1 mg/l	→	0.152 ng/l
0.1 mg/l	→	0.096 ng/l
0.01 mg/l	→	0.061 ng/l