Контрольная работа №2. Сидоров Сергей, КС-30

Вариант 15.

№1 $Co(NO_3)_{2(р\text{-}р)} | Co$; $m_1 = 0{,}01$, $m_2 = 0{,}25$

$Co | Co(NO_3)_{2(р\text{-}р)} || Co(NO_3)_{2(р\text{-}р)} | Co$ $\quad Co^{2+} + 2e^- \rightleftarrows Co \quad E^0 = -0{,}277$ В

$E_{Co^{2+}|Co} = E^0 + \frac{RT}{F} \ln a_{Ag^+}$ $\quad E_{г.э.} = E_{пр.} - E_{лев} = \frac{RT}{F} \ln \frac{a_2}{a_1}$

$a_\pm = m_\pm \gamma_\pm$ $\quad a_{\pm 1} = 0{,}01 \cdot 1{,}133$ $\quad a_{\pm 2} = 0{,}25 \cdot 0{,}455$ $\quad E_{г.э.} = 0{,}059 \lg \frac{0{,}25 \cdot 0{,}455}{0{,}01 \cdot 1{,}133} = 0{,}059$

№2 $H | HBr$ $\quad m_1 = 2{,}0$

№3 $MnO_4^-, Mn^{2+}, H^+ | Pt$, $SO_4^{2-}, H_2SO_3, H^+ | Pt$

а) $MnO_4^- + 8H^+ + 5\bar{e} \rightarrow Mn^{2+} + 4H_2O \quad E^0 = 1{,}51$

$4H^+ + SO_4^{2-} + 2\bar{e} \rightarrow H_2SO_3 + H_2O \quad E^0 = 0{,}172$

б) $E_{MnO_4^-, Mn^{2+}, H^+|Pt} = E^0 - \frac{RT}{2F} \ln \frac{a_{MnO_4^-} \times a^8_{H^+}}{a_{Mn^{2+}} \times a^4_{H_2O}}$

$E_{SO_4^{2+}, H_2SO_3, H^+|Pt} = E^0 - \frac{RT}{2F} \ln \frac{a_{SO_4^{2-}} \times a^4_{H^+}}{a_{H_2SO_3} \times a_{H_2O}}$

в) K⊕ / A⊖

$2\times | MnO_4^- + 8H^+ + 5\bar{e} \rightarrow Mn^{2+} + 4H_2O$

$5\times | H_2SO_3 + H_2O \rightarrow 4H^+ + SO_4^{2-} + 2\bar{e}$

$n = 10 \quad \Sigma_{р\text{-}р}: 2MnO_4^- + 16H^+ + \cancel{10e} + 5H_2SO_3 + 5H_2O \rightleftarrows 2Mn^{2+} + 8H_2O + 20H^+ + 5SO_4^{2-} + \cancel{10e}$

г) ⊖ $Pt | H^+, H_2SO_3, SO_4^{2-} || MnO_4^-, Mn^{2+}, H^+ | Pt$ ⊕

д) $E^0_{г.э.} = 1{,}51 - 0{,}172 = 1{,}338$ В $\quad \lg K_a = \frac{nE^0}{0{,}059} = \frac{10 \cdot 1{,}338}{0{,}059} = 226{,}78$

$K_a = 2{,}35$

б) $1{,}51 - 0{,}059 \cdot 5 \cdot \ln \frac{0{,}1 \cdot 0{,}2^8}{0{,}02 \cdot 1^4} = 34{,}74 = E_{MnO_4^-, Mn^{2+}, H^+|Pt}$

$0{,}172 - 0{,}059 \cdot 2 \cdot \ln \frac{0{,}01 \cdot 0{,}2^4}{0{,}01 \cdot 1} = 7{,}77 = E_{SO_4^{2+}, H_2SO_3, H^+|Pt}$

№ 4) $AgIO_3 + e \rightleftarrows Ag + IO_3^-$ $E_{AgIO_3/Ag} = E^\circ_{Ag^+/Ag} + \frac{RT}{F} \ln a_{Ag^+}$

$a_{Ag^+} = \frac{L}{a_{IO_3^-}}$ $E_{AgIO_3/Ag} = E^\circ_{Ag^+/Ag} + \frac{RT}{F} \ln \frac{L}{a_{IO_3^-}} = E^\circ_{Ag^+/Ag} + \frac{RT}{F} \ln L - \frac{RT}{F} \ln a_{IO_3^-}$

$E_{AgIO_3/Ag} = E^\circ_{Ag^+/Ag} + \frac{RT}{F} \ln L$

$\ln L = \frac{(0,354 - 0,799) \cdot 96485}{8,314 \cdot 298} = -17,330$