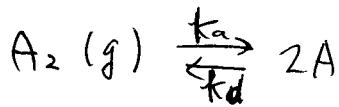
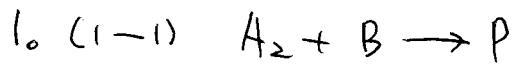


$$t \rightarrow \frac{P_0}{2} \sum \vec{F}_i^2 = \frac{C}{2}$$



$$\text{adsorp. } \frac{d\theta}{dt} = k_a P_A \{N(1-\theta)^2\}$$

$$\text{des. } \frac{d\theta}{dt} = -k_d(N\theta)^2$$

$$\text{at equil } k_a P_A \{N(1-\theta)^2\} = k_d (N\theta)^2$$

$$\theta = \frac{(k_p P_A)^{\frac{1}{2}}}{1 + (k_p P_A)^{\frac{1}{2}}} \text{, where } k = \frac{k_a}{k_d}$$

(1-2) ER

$$V = k P_B \theta = k \frac{(k_p P_A)^{\frac{1}{2}}}{1 + (k_p P_A)^{\frac{1}{2}}} \cdot P_B$$

(2) A combination of Helmholtz model and Gouy-Chapman model.

The electrode surface is a rigid plane of, say, excess positive charge. Next to it is a plane of negatively charged ions with their solvating molecules, called the OHP. Adjoining this region is a diffuse layer with perhaps only a slight excess of negative charge. This region fades away into the bulk neutral solution.

(3) The emission of a second electron after high energy radiation has expelled another. The 1st electron to depart leaves a hole in a low-lying orbital, and an upper electron falls into it. The energy this release results in the ejection of another electron.

(4) $V_{ox} = k_c [O_x]$

$$i = \frac{dQ}{dt}, \quad V_{ox} = \frac{[O_x]}{Z F} = \frac{j_c}{Z F} \uparrow \frac{j_c}{F}$$

if $Z=1$

$$\therefore j_c = F k_c [O_x]$$

$$\left[\frac{C}{S \cdot cm^2} \right] = \left(\frac{C}{mol} \right) k_c \left(\frac{mol}{cm^3} \right) \Rightarrow k_c [=] \frac{Cm}{S}$$

$$2. (1) (a) \Delta^{\neq} G_C(0) \Rightarrow e_1 x_1$$

$$\Delta^+ G_a(0) \Rightarrow \frac{P_2}{P_1} x_1$$

$$(b) \Delta^{\pm} G_c(0) + \times F \Delta \phi \rightarrow 0$$

$$\Delta^f G_a(0) - (1-\chi) F \propto \phi^{-\frac{2}{3}} \chi^{\frac{2}{3}}$$

$$(2) \bar{J} = J_0 e^{(c - \alpha) f_{\text{M}}}$$

$$\frac{\bar{j}_1}{\bar{j}_2} = e^{(1-\alpha) f(\eta_1 - \eta_2)} \Rightarrow \bar{j}_2 = \bar{j}_1 e^{(1-\alpha) f(\eta_2 - \eta_1)}$$

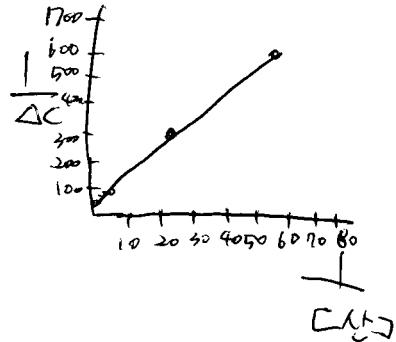
$$j_2 = (1.22 \frac{mA}{cm^2}) e^{\frac{(0.5)(0.60V - 0.50V)}{0.02569V}} = 8.5 \frac{mA}{cm^2}$$

$$3. (1) \quad \frac{1}{\Delta m} = \frac{1}{k \cdot K_{[gas]}} + \frac{1}{k} \quad \text{을 } 0^\circ \text{C } 101.3 \text{ kPa } \text{에서 } K \text{ 계산.}$$

\rightarrow ② 우(해) $1/\Delta c \equiv 1/\Delta [\text{A}_S]$ 의 관계로 plot.

$1/(c_{\text{SE}})$	$1/\sigma_c$
1.428	198
2.708	170
6.601	181
22.9	353
59.2	654

plot



$$y \cancel{x^2} \cancel{z^2} = \frac{1}{k} \rightarrow k = \frac{1}{(4)^2} (= 0.0025)$$

$$T_{\frac{1}{2}} = 8.45 \quad (= \frac{1}{k \cdot k_{eq}})$$

$$K = 16.7$$

$$(2) \chi_w = \frac{1}{4} \bar{N} = \frac{P}{(2\pi m kT)^{\frac{1}{2}}}$$

$$10^{-6} \text{ torr} = 10^{-6} \text{ torr} \cdot \frac{1 \text{ atm}}{760 \text{ torr}} \cdot \frac{1.01325 \times 10^5 \text{ Pa}}{1 \text{ atm}} = 1.333 \times 10^{-4} \text{ Pa}$$

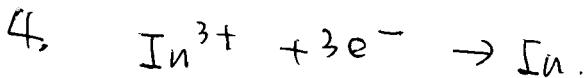
$$\begin{aligned}\chi_w &= \frac{(1.333 \times 10^{-4} \text{ Pa})(6.022 \times 10^{23} / \text{mol})}{(2\pi (32 \times 10^{-3} \frac{\text{kg}}{\text{mol}})(8.314 \text{ J/K} \cdot \text{mol})(298 \text{ K}))^{\frac{1}{2}}} \\ &= 3.60 \times 10^{16} / \text{m}^2 \cdot \text{s} \times \frac{1 \text{ m}^2}{10^4 \text{ cm}^2} \\ &= 3.60 \times 10^{14} / \text{cm}^2 \cdot \text{s}\end{aligned}$$



$$\theta_A = \frac{(k_A P_A)^{\frac{1}{2}}}{1 + (k_A P_A)^{\frac{1}{2}} + k_B P_B}$$

$$\theta_B = \frac{k_B P_B}{1 + k_B P_B + (k_A P_A)^{\frac{1}{2}}}$$

$$v = \frac{k(k_A P_A)^{\frac{1}{2}} k_B P_B}{1 + (k_A P_A)^{\frac{1}{2}} + k_B P_B}$$



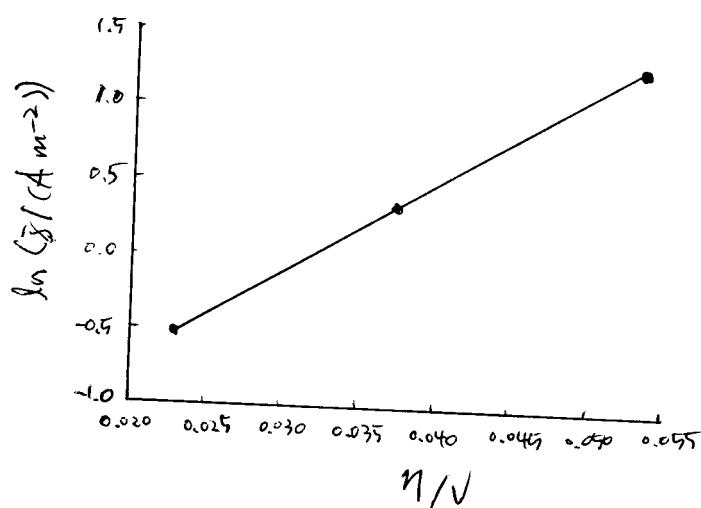
$$\Delta^f G_c = \Delta^f G_c(0) + z \alpha F \Delta \phi$$

$$\ln J = \ln j_0 + z(1-\alpha) f \eta \text{ anode}$$

$$\ln(-J) = \ln j_0 - z \alpha f \eta \text{ cathode}$$

$J / (\text{A m}^{-2})$	$-E / \text{V}$	η / V	$\ln(J / (\text{A m}^{-2}))$
0	0.388	0	
0.590	0.365	0.023	-0.5276
1.438	0.350	0.038	0.3633
3.501	0.335	0.053	1.255

Plot



$$z(1-\alpha)f = 59.42 \text{ V}^{-1}$$

$$sd = 0.0154$$

$$\ln j_0 = -1.894, \quad sd = 0.0006$$

$R = 1$ (almost exact)

Solve α from $z(1-\alpha)f = 59.42 \text{ V}^{-1}$

$$\rightarrow \alpha = 1 - \frac{59.42 \text{ V}^{-1}}{3f} = 1 - \left(\frac{59.42 \text{ V}^{-1}}{3} \right) \times (0.025262 \text{ V}) \\ = 0.4996 = \underline{\underline{0.50}}$$

$$\bar{j}_0 = e^{-1.894} = \underline{\underline{0.150 \text{ A m}^{-2}}}$$

$$\ln(-\bar{j}_c) = \ln \bar{j}_0 - 2\alpha f \eta \quad \eta = 0.023 \text{ V} \quad \text{at} \quad -\frac{E}{V} = 0.365 \\ = -1.894 - (3 \times 0.4996 \times 0.023) / (0.025262) \\ = -3.259$$

$$-\bar{j}_c = e^{-3.259} = 0.0384 \text{ A m}^{-2}$$

$$-\bar{j}_c = \boxed{0.0384 \text{ A m}^{-2}}$$

5. At large positive values of the overpotential the current density is anodic.

$$\bar{j} = \bar{j}_0 [e^{(1-\alpha)f\eta} - e^{-\alpha f\eta}]$$

$$\approx \bar{j}_0 e^{(1-\alpha)f\eta} = \bar{j}_0$$

$$\ln \bar{j} = \ln \bar{j}_0 + (1-\alpha)f\eta$$

Performing a linear regression of $\ln \bar{j}$ against η , we find

$$\ln (\bar{j}_0 / \text{mA m}^{-2}) = -10.826, \quad \text{sd} = 0.287$$

$$(1-\alpha)f = 19.550 \text{ V}^{-1}, \quad \text{sd} = 0.355$$

$$R = 0.99901$$

$$\bar{j}_0 = e^{-10.826 \text{ mA m}^{-2}} = 2.00 \times 10^{-5} \text{ mA m}^{-2}$$

$$\alpha = 1 - \frac{19.550 \text{ V}^{-1}}{f} = 1 - \frac{19.550 \text{ V}^{-1}}{(0.025693 \text{ V})^{-1}}$$

$$\alpha = 0.498$$

The linear regression explains 99.90 percent of the variation in $\ln \bar{j}$ against η plot and standard deviations are low.

There are no deviations from the Tafel equation / plot.