Important Tafel Slope Formulas PDF

Formulas
Examples
with Units

List of 16
Important Tafel Slope Formulas

1) Charge Transfer Coefficient given Tafel Slope Formula

Evaluate Formula

Formula

$$\alpha = \frac{\ln(10) \cdot [BoltZ] \cdot T}{A_{slope} \cdot e}$$

Example with Units

$$0.6034 = \frac{\ln(10) \cdot 1.4E\text{-}23\,J/K \cdot 298\,K}{0.098\,V \cdot 1.602E\text{-}19\,C}$$

2) Charge Transfer Coefficient given Thermal Voltage Formula

Evaluate Formula

Formula

$$\alpha = \frac{\ln(10) \cdot V_t}{A_{slope}}$$

Example with Units

$$0.6038 = \frac{\ln(10) \cdot 0.0257\,V}{0.098\,V}$$

3) Current Density for Anodic Reaction from Tafel Equation Formula

Evaluate Formula

Formula

$$i = \left(10^{\frac{\eta}{A_{slope}}}\right) \cdot i_0$$

Example with Units

$$0.4047\,A/m^2 = \left(10^{\frac{0.03\,V}{0.098\,V}}\right) \cdot 0.2\,A/m^2$$

4) Current Density for Cathodic Reaction from Tafel Equation Formula

Evaluate Formula

Formula

$$i = \left(10^{\frac{\eta}{-A_{slope}}}\right) \cdot i_0$$

Example with Units

$$0.0988\,A/m^2 = \left(10^{\frac{0.03\,V}{-0.098\,V}}\right) \cdot 0.2\,A/m^2$$

5) Electric Elementary Charge given Tafel Slope Formula

Evaluate Formula

Formula

$$e = \frac{\ln(10) \cdot [BoltZ] \cdot T}{A_{slope} \cdot \alpha}$$

Example with Units

$$1.6E\text{-}19\,C = \frac{\ln(10) \cdot 1.4E\text{-}23\,J/K \cdot 298\,K}{0.098\,V \cdot 0.6}$$

6) Electric Elementary Charge given Thermal Voltage Formula

Evaluate Formula

Formula

$$e = \frac{[BoltZ] \cdot T}{V_t}$$

Example with Units

$$1.6E\text{-}19\,C = \frac{1.4E\text{-}23\,J/K \cdot 298\,K}{0.0257\,V}$$

7) Exchange Current Density for Anodic Reaction from Tafel Equation Formula

Evaluate Formula

Formula

$$i_0 = \frac{i}{10^{\frac{\eta}{+A_{slope}}}}$$

Example with Units

$$0.2001\,A/m^2 = \frac{0.405\,A/m^2}{10^{\frac{0.03\,V}{+0.098\,V}}}$$

8) Exchange Current Density for Cathodic Reaction from Tafel Equation Formula

Evaluate Formula

Formula

$$i_0 = \frac{i}{10^{\frac{\eta}{-A_{slope}}}}$$

Example with Units

$$0.8196\,A/m^2 = \frac{0.405\,A/m^2}{10^{\frac{0.03\,V}{-0.098\,V}}}$$

9) Overpotential for Anodic Reaction from Tafel Equation Formula

Evaluate Formula

Formula

$$\eta = +\left(A_{slope}\right)\cdot\left(\log10\left(\frac{i}{i_0}\right)\right)$$

Example with Units

$$0.03\,V = +\left(0.098\,V\right)\cdot\left(\log10\left(\frac{0.405\,A/m^2}{0.2\,A/m^2}\right)\right)$$

10) Overpotential for Cathodic Reaction from Tafel Equation Formula

Evaluate Formula

Formula

$$\eta = -\left(A_{slope}\right)\cdot\left(\log10\left(\frac{i}{i_0}\right)\right)$$

Example with Units

$$-0.03\,V = -\left(0.098\,V\right)\cdot\left(\log10\left(\frac{0.405\,A/m^2}{0.2\,A/m^2}\right)\right)$$

11) Tafel Slope for Anodic Reaction from Tafel Equation Formula

Evaluate Formula

Formula

$$A_{slope} = +\frac{\eta}{\log10\left(\frac{i}{i_0}\right)}$$

Example with Units

$$0.0979\,V = +\frac{0.03\,V}{\log10\left(\frac{0.405\,A/m^2}{0.2\,A/m^2}\right)}$$

12) Tafel Slope for Cathodic Reaction from Tafel Equation Formula

Evaluate Formula

Formula

$$A_{slope} = -\frac{\eta}{\log10\left(\frac{i}{i_0}\right)}$$

Example with Units

$$-0.0979\,V = -\frac{0.03\,V}{\log10\left(\frac{0.405\,A/m^2}{0.2\,A/m^2}\right)}$$

13) Tafel Slope given Temperature and Charge Transfer Coefficient Formula

Evaluate Formula

Formula

$$A_{slope} = \frac{\ln(10)\cdot[BoltZ]\cdot T}{e\cdot\alpha}$$

Example with Units

$$0.0986\,V = \frac{\ln(10)\cdot 1.4E\text{-}23\,J/K\cdot 298\,K}{1.602E\text{-}19\,C\cdot 0.6}$$

14) Tafel Slope given Thermal Voltage Formula

Evaluate Formula

Formula

$$A_{slope} = \frac{\ln(10) \cdot V_t}{\alpha}$$

Example with Units

$$0.0986\,\text{V} = \frac{\ln(10) \cdot 0.0257\,\text{V}}{0.6}$$

15) Thermal Voltage given Tafel Slope Formula

Evaluate Formula

Formula

$$V_t = \frac{A_{slope} \cdot \alpha}{\ln(10)}$$

Example with Units

$$0.0255\,\text{V} = \frac{0.098\,\text{V} \cdot 0.6}{\ln(10)}$$

16) Thermal Voltage given Temperature and Electric Elementary Charge Formula

Evaluate Formula

Formula

$$V_t = \frac{[BoltZ] \cdot T}{e}$$

Example with Units

$$0.0257\,\text{V} = \frac{1.4E\text{-}23\,\text{J/K} \cdot 298\,\text{K}}{1.602E\text{-}19\,\text{C}}$$

Variables used in list of Tafel Slope Formulas above

- A_{slope} Tafel Slope *(Volt)*
- **e** Elementary Charge *(Coulomb)*
- **i** Electric Current Density *(Ampere per Square Meter)*
- i_0 Exchange Current Density *(Ampere per Square Meter)*
- **T** Temperature *(Kelvin)*
- V_t Thermal Voltage *(Volt)*
- **α** Charge Transfer Coefficient
- **η** Overpotential *(Volt)*

Constants, Functions, Measurements used in list of Tafel Slope Formulas above

- constant(s): **[BoltZ]**, 1.38064852E-23
  Boltzmann constant
- Functions: **ln**, ln(Number)
  The natural logarithm, also known as the logarithm to the base e, is the inverse function of the natural exponential function.
- Functions: **log10**, log10(Number)
  The common logarithm, also known as the base-10 logarithm or the decimal logarithm, is a mathematical function that is the inverse of the exponential function.
- Measurement: **Temperature** in Kelvin (K)
  Temperature Unit Conversion
- Measurement: **Electric Charge** in Coulomb (C)
  Electric Charge Unit Conversion
- Measurement: **Surface Current Density** in Ampere per Square Meter (A/m²)
  Surface Current Density Unit Conversion
- Measurement: **Electric Potential** in Volt (V)
  Electric Potential Unit Conversion

Download other Important Electrochemistry PDFs

- Important Activity of Electrolytes Formulas
- Important Concentration of Electrolyte Formulas
- Important Conductance and Conductivity Formulas
- Important Electrochemical Cell Formulas
- Important Electrolytes & Ions Formulas
- Important EMF of Concentration Cell Formulas
- Important Equivalent Weight Formulas
- Important Ionic Strength Formulas
- Important Osmotic Coefficient & Current Efficiency Formulas
- Important Resistance and Resistivity Formulas
- Important Tafel Slope Formulas
- Important Temperature of Concentration Cell Formulas

Try our Unique Visual Calculators

- Percentage increase
- HCF calculator
- Mixed fraction

Please SHARE this PDF with someone who needs it!

This PDF can be downloaded in these languages

English Spanish French German Russian Italian Portuguese Polish Dutch

7/8/2024 | 11:36:35 AM UTC