

Important Formulas of Adsorption Isotherm PDF



Formulas Examples with Units

List of 11 Important Formulas of Adsorption Isotherm

1) Adsorption constant k using Freundlich Adsorption Constant Formula

Formula

$$k = \frac{x_{\text{gas}}}{m \cdot P_{\text{gas}}^{\frac{1}{n}}}$$

Example with Units

$$3.3385 = \frac{8 \text{ g}}{4 \text{ g} \cdot 0.215 \text{ Pa}^{\frac{1}{3}}}$$

Evaluate Formula

2) Equilibrium Concentration of Aqueous Adsorbate using Freundlich Equation Formula

Formula

$$c = \left(\frac{M}{(m \cdot k)^n} \right)$$

Example with Units

$$4770.5068 = \left(\frac{12 \text{ g}}{(4 \text{ g} \cdot 3.4)^3} \right)$$

Evaluate Formula

3) Equilibrium Pressure of Gaseous Adsorbate using Freundlich Equation Formula

Formula

$$p = \left(\left(\frac{M}{m \cdot k} \right)^n \right)$$

Example with Units

$$0.687 = \left(\left(\frac{12 \text{ g}}{4 \text{ g} \cdot 3.4} \right)^3 \right)$$

Evaluate Formula

4) Mass of Adsorbent for Langmuir Adsorption Formula

Formula

$$m_L = \frac{x_{\text{gas}} \cdot (1 + k \cdot P_{\text{gas}})}{k \cdot P_{\text{gas}}}$$

Example with Units

$$18.9439 \text{ g} = \frac{8 \text{ g} \cdot (1 + 3.4 \cdot 0.215 \text{ Pa})}{3.4 \cdot 0.215 \text{ Pa}}$$

Evaluate Formula

5) Mass of Adsorbent using Freundlich Adsorption Isotherm Formula

Formula

$$m = \frac{x_{\text{gas}}}{k \cdot P_{\text{gas}}^{\frac{1}{n}}}$$

Example with Units

$$3.9276 \text{ g} = \frac{8 \text{ g}}{3.4 \cdot 0.215 \text{ Pa}^{\frac{1}{3}}}$$

Evaluate Formula

6) Mass of Gas Adsorbed Formula

Formula

$$x_{\text{gas}} = m \cdot k \cdot P_{\text{gas}}^{\frac{1}{n}}$$

Example with Units

$$8.1474 \text{ g} = 4 \text{ g} \cdot 3.4 \cdot 0.215 \text{ Pa}^{\frac{1}{3}}$$

Evaluate Formula



7) Mass of Gas Adsorbed in grams for Langmuir Adsorption Formula

Formula

$$x_{\text{gas}} = \frac{m_L \cdot k \cdot P_{\text{gas}}}{1 + (k \cdot P_{\text{gas}})}$$

Example with Units

$$8.0237 \text{ g} = \frac{19 \text{ g} \cdot 3.4 \cdot 0.215 \text{ Pa}}{1 + (3.4 \cdot 0.215 \text{ Pa})}$$

Evaluate Formula 

8) Surface Area of Adsorbent Covered Formula

Formula

$$\theta = \frac{k \cdot P_{\text{gas}}}{1 + (k \cdot P_{\text{gas}})}$$

Example with Units

$$0.4223 = \frac{3.4 \cdot 0.215 \text{ Pa}}{1 + (3.4 \cdot 0.215 \text{ Pa})}$$

Evaluate Formula 

9) Total Volume of Gas Adsorbed at Equilibrium by BET Equation Formula

Formula

$$V_{\text{total}} = \frac{V_{\text{mono}} \cdot C \cdot \left(\frac{P_v}{P_0}\right)}{\left(P_v - \left(\frac{P_v}{P_0}\right)\right) \cdot \left(1 + \left(C \cdot \left(\frac{P_v}{P_0}\right)\right)\right) - \left(\frac{P_v}{P_0}\right)}$$

Example with Units

$$998.5352 \text{ L} = \frac{15192 \text{ L} \cdot 2 \cdot \left(\frac{6 \text{ Pa}}{21 \text{ Pa}}\right)}{\left(6 \text{ Pa} - \left(\frac{6 \text{ Pa}}{21 \text{ Pa}}\right)\right) \cdot \left(1 + \left(2 \cdot \left(\frac{6 \text{ Pa}}{21 \text{ Pa}}\right)\right)\right) - \left(\frac{6 \text{ Pa}}{21 \text{ Pa}}\right)}$$

Evaluate Formula 

10) Van Der Waals Interaction Energy Formula

Formula

$$U_{\text{VWaaals}} = - \frac{A}{12 \cdot \pi \cdot (h)^2}$$

Example with Units

$$-8.3\text{E-}27 \text{ J} = - \frac{3.2\text{E-}21 \text{ J}}{12 \cdot 3.1416 \cdot (101 \text{ m})^2}$$

Evaluate Formula 

11) Volume of Monolayer Gas by BET Equation Formula

Formula

$$V_{\text{mono}} = \frac{\left(P_v - \left(\frac{P_v}{P_0}\right)\right) \cdot \left(1 + \left(C \cdot \left(\frac{P_v}{P_0}\right)\right)\right) - \left(\frac{P_v}{P_0}\right) \cdot V_{\text{total}}}{C \cdot \left(\frac{P_v}{P_0}\right)}$$

Example with Units

$$15215.2857 \text{ L} = \frac{\left(6 \text{ Pa} - \left(\frac{6 \text{ Pa}}{21 \text{ Pa}}\right)\right) \cdot \left(1 + \left(2 \cdot \left(\frac{6 \text{ Pa}}{21 \text{ Pa}}\right)\right)\right) - \left(\frac{6 \text{ Pa}}{21 \text{ Pa}}\right) \cdot 998 \text{ L}}{2 \cdot \left(\frac{6 \text{ Pa}}{21 \text{ Pa}}\right)}$$

Evaluate Formula 



Variables used in list of Important Formulas of Adsorption Isotherm above


- **A** Hamaker Coefficient (*Joule*)
- **c** Equilibrium Concentration of Aqueous Adsorbate
- **C** Adsorbent Constant
- **h** Surface Separation (*Meter*)
- **k** Adsorption Constant
- **m** Mass of Adsorbent (*Gram*)
- **M** Mass of Adsorbate (*Gram*)
- **m_L** Mass of Adsorbent for Langmuir Adsorption (*Gram*)
- **n** Freundlich Adsorption Constant
- **p** Equilibrium Pressure of the Gaseous Adsorbate
- **P₀** Saturated Vapor Pressure of Gas (*Pascal*)
- **P_{gas}** Pressure of Gas (*Pascal*)
- **P_v** Vapour Pressure (*Pascal*)
- **U_{VWaals}** Van der Waals Interaction Energy (*Joule*)
- **V_{mono}** Monolayer Volume of Gas (*Liter*)
- **V_{total}** Total Equilibrium Volume of Gas (*Liter*)
- **x_{gas}** Mass of Gas Adsorbed (*Gram*)
- **θ** Surface Area of Adsorbent covered

Constants, Functions, Measurements used in list of Important Formulas of Adsorption Isotherm above

- **constant(s): pi**,
3.14159265358979323846264338327950288
Archimedes' constant
- **Measurement: Length** in Meter (m)
Length Unit Conversion ↻
- **Measurement: Weight** in Gram (g)
Weight Unit Conversion ↻
- **Measurement: Volume** in Liter (L)
Volume Unit Conversion ↻
- **Measurement: Pressure** in Pascal (Pa)
Pressure Unit Conversion ↻
- **Measurement: Energy** in Joule (J)
Energy Unit Conversion ↻



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