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Important Formulas of Colloids

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List of 16 Important Formulas of Colloids

Important Formulas of Colloids

1) Critical Chain Length of Hydrocarbon Tail using Tanford Equation

Open Calculator

fx $l_{c.l} = (0.154 + (0.1265 \cdot n_C))$

ex $6.6055\text{m} = (0.154 + (0.1265 \cdot 51))$

2) Critical Packing Parameter

Open Calculator

fx $CPP = \frac{v}{a_o \cdot l}$

ex $0.018854 = \frac{50\text{E}\hat{}\text{-}6\text{m}^3}{0.0051\text{m}^2 \cdot 52\text{E}\hat{}\text{-}2\text{m}}$

3) Electrophoretic Mobility of Particle

Open Calculator

fx $\mu_e = \frac{v_d}{E}$

ex $0.138889\text{m}^2/\text{V*s} = \frac{5\text{m/s}}{36\text{V/m}}$

4) Ionic Mobility given Zeta Potential using Smoluchowski Equation

Open Calculator

fx $\mu = \frac{\zeta \cdot \varepsilon_r}{4 \cdot \pi \cdot \mu_{liquid}}$

ex $55.98275\text{m}^2/\text{V*s} = \frac{4.69\text{V} \cdot 150}{4 \cdot \pi \cdot 10\text{P}}$

5) Micellar Aggregation Number

Open Calculator

$$N_{mic} = \frac{\left(\frac{4}{3}\right) \cdot \pi \cdot \left(R_{mic}^3\right)}{V_{hydrophobic}}$$

ex $$6.7E\hat{}37 = \frac{\left(\frac{4}{3}\right) \cdot \pi \cdot \left((0.113E\hat{}\text{-}6m)^3\right)}{90E\hat{}\text{-}30m^3}$$

6) Micellar Core Radius given Micellar Aggregation Number

Open Calculator

$$R_{mic} = \left(\frac{N_{mic} \cdot 3 \cdot V_{hydrophobic}}{4 \cdot \pi}\right)^{\frac{1}{3}}$$

ex $$1.1E\hat{}\text{-}7m = \left(\frac{6.7E\hat{}37 \cdot 3 \cdot 90E\hat{}\text{-}30m^3}{4 \cdot \pi}\right)^{\frac{1}{3}}$$

7) Number of Carbon Atoms given Critical Chain Length of Hydrocarbon

Open Calculator

$$n_C = \frac{l_{c.l} - 0.154}{0.1265}$$

ex $$50.95652 = \frac{6.6m - 0.154}{0.1265}$$

8) Number of Moles of Surfactant given Critical Micelle Concentration

Open Calculator

$$[M] = \frac{c - c_{CMC}}{n}$$

ex $$3.428571mol = \frac{50mol/L - 2mol/L}{14/L}$$

9) Specific Surface Area

Open Calculator

fx $$A_{sp} = \frac{3}{\rho \cdot R_{sphere}}$$

ex $$0.002103\text{m}^2/\text{kg} = \frac{3}{1141\text{kg/m}^3 \cdot 1.25\text{m}}$$

10) Specific Surface Area for array of n Cylindrical Particles

Open Calculator

fx $$A_{sp} = \left(\frac{2}{\rho}\right) \cdot \left(\left(\frac{1}{R_{cyl}}\right) + \left(\frac{1}{L}\right)\right)$$

ex $$0.004566\text{m}^2/\text{kg} = \left(\frac{2}{1141\text{kg/m}^3}\right) \cdot \left(\left(\frac{1}{0.85\text{m}}\right) + \left(\frac{1}{0.7\text{m}}\right)\right)$$

11) Surface Enthalpy given Critical Temperature

Open Calculator

fx $$H_s = (k_o) \cdot \left(1 - \left(\frac{T}{T_c}\right)\right)^{k_1 - 1} \cdot \left(1 + \left((k_1 - 1) \cdot \left(\frac{T}{T_c}\right)\right)\right)$$

ex $$54.20196\text{J/K} = (55) \cdot \left(1 - \left(\frac{55.98\text{K}}{190.55\text{K}}\right)\right)^{1.23 - 1} \cdot \left(1 + \left((1.23 - 1) \cdot \left(\frac{55.98\text{K}}{190.55\text{K}}\right)\right)\right)$$

12) Surface Entropy given Critical Temperature

Open Calculator

fx $$S_{surface} = k_1 \cdot k_o \cdot \left(1 - \left(\frac{T}{T_c}\right)\right)^{k_1} - \left(\frac{1}{T_c}\right)$$

ex $$44.09724\text{J/K} = 1.23 \cdot 55 \cdot \left(1 - \left(\frac{55.98\text{K}}{190.55\text{K}}\right)\right)^{1.23} - \left(\frac{1}{190.55\text{K}}\right)$$

13) Surface Viscosity

Open Calculator

$$\eta_s = \frac{\mu_{viscosity}}{d}$$

$$0.049635\text{kg/s} = \frac{10.2\text{P}}{20.55\text{m}}$$

14) Volume of Hydrocarbon Chain using Tanford Equation

Open Calculator

$$V_{mic} = (27.4 + (26.9 \cdot n_C)) \cdot (10^{-3})$$

$$1.3993\text{m}^3 = (27.4 + (26.9 \cdot 51)) \cdot (10^{-3})$$

15) Volume of Hydrophobic Tail given Micellar Aggregation Number

Open Calculator

$$V_{hydrophobic} = \frac{\left(\frac{4}{3}\right) \cdot \pi \cdot \left(R_{mic}^3\right)}{N_{mic}}$$

$$9\text{E^-29m}^3 = \frac{\left(\frac{4}{3}\right) \cdot \pi \cdot \left((0.113\text{E^-6m})^3\right)}{6.7\text{E^37}}$$

16) Zeta Potential using Smoluchowski Equation

Open Calculator

$$\zeta = \frac{4 \cdot \pi \cdot \mu_{liquid} \cdot \mu}{\varepsilon_r}$$

$$4.691445\text{V} = \frac{4 \cdot \pi \cdot 10\text{P} \cdot 56\text{m}^2/\text{V*s}}{150}$$

Variables Used

- **[M]** Number of Moles of Surfactant *(Mole)*
- a_o Optimal Area *(Square Meter)*
- A_{sp} Specific Surface Area *(Square Meter per Kilogram)*
- **c** Total Concentration of Surfactant *(Mole per Liter)*
- c_{CMC} Critical Micelle Concentration *(Mole per Liter)*
- **CPP** Critical Packing Parameter
- **d** Thickness of Surface Phase *(Meter)*
- **E** Electric Field Intensity *(Volt per Meter)*
- H_s Surface Enthalpy *(Joule per Kelvin)*
- k_1 Empirical Factor
- k_o Constant for each Liquid
- **l** Tail Length *(Meter)*
- **L** Length *(Meter)*
- $l_{c.l}$ Critical Chain Length of Hydrocarbon Tail *(Meter)*
- **n** Degree of Aggregation of Micelle *(per Liter)*
- n_C Number of Carbon Atoms
- N_{mic} Micellar Aggregation Number
- R_{cyl} Cylinder Radius *(Meter)*
- R_{mic} Micelle Core Radius *(Meter)*
- R_{sphere} Radius of Sphere *(Meter)*
- $S_{surface}$ Surface Entropy *(Joule per Kelvin)*
- **T** Temperature *(Kelvin)*
- T_c Critical Temperature *(Kelvin)*
- **v** Surfactant Tail Volume *(Cubic Meter)*
- $V_{hydrophobic}$ Volume of Hydrophobic Tail *(Cubic Meter)*
- V_{mic} Micelle Core Volume *(Cubic Meter)*

- ε_r Relative Permittivity of Solvent
- ζ Zeta Potential *(Volt)*
- η_s Surface Viscosity *(Kilogram per Second)*
- μ Ionic Mobility *(Square Meter per Volt per Second)*
- μ_e Electrophoretic Mobility *(Square Meter per Volt per Second)*
- μ_{liquid} Dynamic Viscosity of Liquid *(Poise)*
- $\mu_{viscosity}$ Dynamic Viscosity *(Poise)*
- v_d Drift Velocity of Dispersed Particle *(Meter per Second)*
- ρ Density *(Kilogram per Cubic Meter)*

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Temperature** in Kelvin (K)
  Temperature Unit Conversion
- Measurement: **Amount of Substance** in Mole (mol)
  Amount of Substance Unit Conversion
- Measurement: **Volume** in Cubic Meter (m^3)
  Volume Unit Conversion
- Measurement: **Area** in Square Meter (m^2)
  Area Unit Conversion
- Measurement: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion
- Measurement: **Electric Field Strength** in Volt per Meter (V/m)
  Electric Field Strength Unit Conversion
- Measurement: **Electric Potential** in Volt (V)
  Electric Potential Unit Conversion
- Measurement: **Mass Flow Rate** in Kilogram per Second (kg/s)
  Mass Flow Rate Unit Conversion
- Measurement: **Molar Concentration** in Mole per Liter (mol/L)
  Molar Concentration Unit Conversion
- Measurement: **Dynamic Viscosity** in Poise (P)
  Dynamic Viscosity Unit Conversion
- Measurement: **Density** in Kilogram per Cubic Meter (kg/m^3)
  Density Unit Conversion
- Measurement: **Mobility** in Square Meter per Volt per Second ($m^2/V*s$)
  Mobility Unit Conversion
- Measurement: **Carrier Concentration** in per Liter (1/L)
  Carrier Concentration Unit Conversion

- Measurement: **Entropy** in Joule per Kelvin (J/K)
  Entropy Unit Conversion
- Measurement: **Specific Area** in Square Meter per Kilogram (m^2/kg)
  Specific Area Unit Conversion

Check other formula lists

- **BET Adsorption Isotherm Formulas**
- **Freundlich adsorption isotherm Formulas**
- **Important Formulas of Adsorption Isotherm**
- **Important Formulas of Colloids**
- **Important Formulas on Surface Tension**
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