Important Formulas of Colloids PDF

Formulas
Examples
with Units

List of 16
Important Formulas of Colloids

1) Critical Chain Length of Hydrocarbon Tail using Tanford Equation Formula

Evaluate Formula

Formula

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

Example with Units

$$6.6055\,\text{m} = \left(0.154 + \left(0.1265 \cdot 51\right)\right)$$

2) Critical Packing Parameter Formula

Evaluate Formula

Formula

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

Example with Units

$$0.0189 = \frac{50\text{E-}6\,\text{m}^3}{0.0051\,\text{m}^2 \cdot 52\text{E-}2\,\text{m}}$$

3) Electrophoretic Mobility of Particle Formula

Evaluate Formula

Formula

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

Example with Units

$$0.1389\,\text{m}^2/\text{V*s} = \frac{5\,\text{m/s}}{36\,\text{V/m}}$$

4) Ionic Mobility given Zeta Potential using Smoluchowski Equation Formula

Evaluate Formula

Formula

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

Example with Units

$$55.9828\,\text{m}^2/\text{V*s} = \frac{4.69\,\text{V} \cdot 150}{4 \cdot 3.1416 \cdot 10\,\text{P}}$$

5) Micellar Aggregation Number Formula

Evaluate Formula

Formula

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

Example with Units

$$6.7\text{E+}37 = \frac{\left(\frac{4}{3}\right) \cdot 3.1416 \cdot \left(0.113\text{E-}6\,\text{m}^3\right)}{90\text{E-}30\,\text{m}^3}$$

6) Micellar Core Radius given Micellar Aggregation Number Formula

Evaluate Formula

Formula

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

Example with Units

$$1.1\text{E-}7\,\text{m} = \left(\frac{6.7\text{E+}37 \cdot 3 \cdot 90\text{E-}30\,\text{m}^3}{4 \cdot 3.1416}\right)^{\frac{1}{3}}$$

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

Evaluate Formula

Formula

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

Example with Units

$$50.9565 = \frac{6.6\,\text{m} - 0.154}{0.1265}$$

8) Number of Moles of Surfactant given Critical Micelle Concentration Formula

Evaluate Formula

Formula

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

Example with Units

$$3.4286\,\text{mol} = \frac{50\,\text{mol/L} - 2\,\text{mol/L}}{14\,1/\text{L}}$$

9) Specific Surface Area Formula

Evaluate Formula

Formula

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

Example with Units

$$0.0021\,\text{m\^2/kg} = \frac{3}{1141\,\text{kg/m}^3 \cdot 1.25\,\text{m}}$$

10) Specific Surface Area for array of n Cylindrical Particles Formula

Evaluate Formula

Formula

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

Example with Units

$$0.0046\,\text{m\^2/kg} = \left(\frac{2}{1141\,\text{kg/m}^3}\right) \cdot \left(\left(\frac{1}{0.85\,\text{m}}\right) + \left(\frac{1}{0.7\,\text{m}}\right)\right)$$

11) Surface Enthalpy given Critical Temperature Formula

Evaluate Formula

Formula

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

Example with Units

$$54.202\,\text{J/K} = \left(55\right) \cdot \left(1 - \left(\frac{55.98\,\text{K}}{190.55\,\text{K}}\right)\right)^{1.23 - 1} \cdot \left(1 + \left(\left(1.23 - 1\right) \cdot \left(\frac{55.98\,\text{K}}{190.55\,\text{K}}\right)\right)\right)$$

12) Surface Entropy given Critical Temperature Formula

Evaluate Formula

Formula

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

Example with Units

$$44.0972\,J/K = 1.23 \cdot 55 \cdot \left(1 - \left(\frac{55.98\,K}{190.55\,K}\right)\right)^{1.23} - \left(\frac{1}{190.55\,K}\right)$$

13) Surface Viscosity Formula

Evaluate Formula

Formula

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

Example with Units

$$0.0496\,kg/s = \frac{10.2\,P}{20.55\,m}$$

14) Volume of Hydrocarbon Chain using Tanford Equation Formula

Evaluate Formula

Formula

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

Example with Units

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

15) Volume of Hydrophobic Tail given Micellar Aggregation Number Formula

Evaluate Formula

Formula

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

Example with Units

$$9E\text{-}29\,m^3 = \frac{\left(\frac{4}{3}\right) \cdot 3.1416 \cdot \left(0.113E\text{-}6\,m^{3}\right)}{6.7E+37}$$

16) Zeta Potential using Smoluchowski Equation Formula

Evaluate Formula

Formula

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

Example with Units

$$4.6914\,V = \frac{4 \cdot 3.1416 \cdot 10\,P \cdot 56\,m^2/V*s}{150}$$

Variables used in list of Important Formulas of Colloids above

- **[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)*

Constants, Functions, Measurements used in list of Important Formulas of Colloids above

- constant(s): **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 (m³)
  Volume Unit Conversion
- Measurement: **Area** in Square Meter (m²)
  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/m³)
  Density Unit Conversion
- Measurement: **Mobility** in Square Meter per Volt per Second (m²/V*s)
  Mobility Unit Conversion
- Measurement: **Carrier Concentration** in per Liter (1/L)
  Carrier Concentration Unit Conversion

- 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)*

- 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

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