

CERAMIC AND COLLOIDAL PROCESSING - EXERCISES

Prof. Paul Bowen
Dr. Andrea Testino
2021

Exercises 8

1. What are the different steps to follow for suspending a powder in a liquid?
2. Calculate the surface charge density σ of a surface immersed in an electrolyte solution, knowing its surface potential and the composition of the solution.

Examples:

- a) $\Phi_o = -75.0$ [mV]; 0.15 [M] aqueous solution in NaCl, $T = 25^\circ \text{C}$ ($\epsilon_r = 78.5$ [-]).
- b) $\Phi_o = -35.0$ [mV]; 0.010 [M] aqueous solution in NaCl, $T = 75^\circ \text{C}$ ($\epsilon_r = 78.5$ [-]).

Note: Watch out for units! It is recommended to convert all numeric data in the international system of units before performing calculations.

- 3 Knowing the temperature ($T = 25^\circ \text{C}$), calculate the Debye length $1/\kappa$ in aqueous solutions containing various concentrations of electrolytes.

Examples:

- a) Pure water at $T = 25^\circ \text{C}$, ($[\text{H}^+] = [\text{OH}^-] = 10^{-7} \text{ M}$).
- b) 0.010 [M] aqueous solution in NaCl.
- c) 0.010 [M] aqueous solution in Na_2SO_4 .
- d) 0.010 [M] aqueous solution in $\text{Al}_2(\text{SO}_4)_3$.

4. How is the electrical double layer formed at a charged surface in an electrolyte?

5. What is the sign of the zeta potential on the surfaces of SiO_2 , ZrO_2 , TiO_2 , Al_2O_3 , ZnO_2 and MgO powders in water at pH 7.5.

6. What is the isoelectric point (iep)?