Assignment 5

Due on 2022-05-21, 23:59 IST

The objective of this assignment is to test your understanding of the concepts discussed in the course. You will be asked to solve a series of problems related to the topics covered in the last few weeks.

1. What is the surface charge of the particle acquired? 1 point
   - Positron
   - Negative
   - Neutral

2. Identify the charged group on the particle surface? 1 point
   - CO
   - O
   - COO
   - COOH

3. Identify the counter ions in the solution? 1 point
   - CO
   - O
   - COO
   - COOH

4. The surface charge density is 5.5 x 10^4 C/m². The electric charge on an electron is -1.6 x 10^-19 C. Calculate the number of surface groups on the surface of a single particle. 1 point

5. Saturated free solution (poly styrene) particles are purchased from a supplier to study electrostatic interactions in solution. Following are the data as supplied by the manufacturer:
   - Mean Diameter: 2.1 µm
   - Percent Solid (w/v): 4.4 %
   - Density of Polymer at 20°C: 1.0 x 10^3 g/cm³

   Given that the number of surface groups on the surface of a single particle is 5.5 x 10^4 C/m². Calculate the surface charge density in C/m².

Figure 1 shows the scaled depletion potential as a function of separation distance estimated by the Inui-Jones model for a system of three particles A, B, and C. The depletion potential is represented by the black solid line. 1 point

Evaluate the following statements:

- If Φ > 0, then depletion volume is zero.
- If Φ < 0, then depletion volume is not zero.

Figure 2 shows a typical depletion potential as a function of separation distance estimated by the Inui-Jones model for a system of three particles A, B, and C. The depletion potential is represented by the black solid line. 1 point

Evaluate the following statements:

- If Φ > 0, then depletion volume is zero.
- If Φ < 0, then depletion volume is not zero.