Unit 5 - Week 4

Course outline

Assignment 4

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-10-14, 23:59 IST.

The concept of negative Hamaker constant can be used to explain particle engulfment by an advancing solidification front. Typically, this is accomplished by considering a dispersion of solid particles and then the liquid medium is allowed to solidify by subjecting the dispersion to a thermal gradient.

A laboratory experiment is performed by considering liquid naphthalene dispersed with (a) polystyrene (b) Nylon 6 (c) Teflon and (d) Nylon 12. The liquid naphthalene is solidified and it is required to find if the dispersed particles are engulfed (E) or rejected (E) by the solidification front. The surface tensions of solid naphthalene (denoted by 1) and liquid naphthalene (denoted 3) are 26.4 and 32.8 mJ/m^2, respectively. Complete the following table by filling up the entries in the last column with letter E or R to indicate engulfment or rejection of the particle. [Hint: A_{321}].

Particle (Dispersed phase)	Interfacial Tension (mJ/m^2)	Engulfed (E) or Rejected (R)?
Polystyrene	27.6	A
Nylon 6	41.7	B
Teflon	15.5	C
Nyln 12	38.4	D

1) A _______________ ?

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: String) E

2.5 points

2) B _______________ ?

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: String) R

2.5 points

3) C _______________ ?

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: String) E

2.5 points

4) D _______________ ?

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: String) R

2.5 points

Consider a dilute dispersion of cube like particles. Assume each that each side of the cube is 1 micrometer in length. A small quantity of non-adsorbing polymer of radius gyration 2Rg=10 nm is added to the dispersion of cubes. The concentration of polymer in the colloid-polymer mixture is 6.9×10^{20} molecules/m3. Assume that the dispersion is at 298 K. If the interaction potential between cubes can be modeled analogous to interaction between two flat plates, calculate the strength of interaction when the distance of separation between the colloidal particles is (a) h = 20 nm and (b) h = 9.9 nm . The Boltzmann constant, kB is 1.3807 X 10^{-23} J K^{-1}. Express the strength of depletion attraction in terms of thermal energy (i.e., kBT).

5) h= 20 nm

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 0

2 points

6) h=9.9 nm

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) -21.5,-19.5

4 points

Answer the following questions

7) The addition of polymer to a colloidal dispersion ***1 point***

- Increases the viscosity of the colloidal dispersion
- Destabilizes the colloidal dispersion
- Stabilizes the colloidal dispersion
- only (b) and (c) are correct and (a) is wrong
- (a) and (b) and (c) are correct
- only (a) and (b) are correct and (c) is wrong
- only (a) and (c) are correct and (b) is wrong

No, the answer is incorrect.
Score: 0
Accepted Answers:
(a) and (b) and (c) are correct

8) The following is a type of attractive interaction that arises because of addition of polymer ***1 point***

- Van der Waals
- Steric interaction
- Hard sphere interaction
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
None of the above

9) The destabilization of a colloid-polymer mixture can occur due to ***1 point***

- Bridging
- Depletion Interaction
- Steric stabilization
- Steric repulsion
- both (a) and (b)
- both (c) and (d)

No, the answer is incorrect.
Score: 0
Accepted Answers:
both (a) and (b)

10) The stabilization of colloids in a colloid-polymer mixture can occur due to ***1 point***

- Bridging
- Depletion Interaction
- Steric stabilization
- Steric repulsion
- both (a) and (b)
- both (c) and (d)

No, the answer is incorrect.
Score: 0
Accepted Answers:
both (c) and (d)