تفريغ حساب وتركيب الأشكال الصيدلانية

اسم الموضوع: Suspensions

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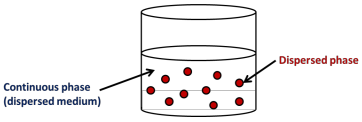
Soul Academy

لجان الدفعات

Part 1: Introduction and advantages

Definition



- A **suspension** consists of a dispersion of insoluble **solid particles** in a **liquid**.

صغيرة

- In a suspension, the particle size is generally > 1µm.

- Different to a colloidal system, where particle size is < 1 µm.

7

Solid in liquid colloids *vs*. solutions

miscible

- Suppose we add a powder of drug to water. How do I know if I have a colloid or a solution?

- In a true solution, the drug molecules are dispersed on the molecular scale in the solution – each molecule is isolated from all other drug molecules;

- In a colloid, we have ***particles*** of drug – aggregates consisting of many drug molecules.

زي كتل

8

Stokes' law

σ: density of solid — sedimentation علاقة طردية مع
ρ: density of liquid — sedimentation علاقة عكسية مع

Given that:

$$V = \frac{2a^2 g(\sigma - \rho)}{9\eta}$$

رقم ثابت

طردي [σ, a²]

عكسي [η, ρ]

Will the sedimentation velocity go up or down if we:

- Increase the radii of the particles? ↑
- Increase the density of the solid? ↑
- Increase the density of the liquid? ↓
- Decrease the density of the liquid? ↑
- Increase the viscosity of the liquid? ↓
- Decrease the viscosity of the liquid? ↑

Stokes' law

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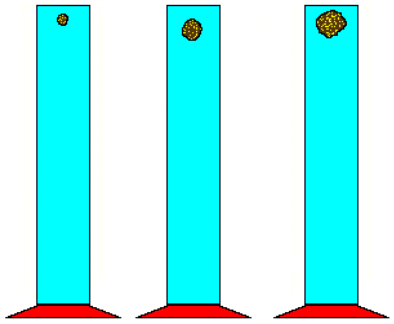
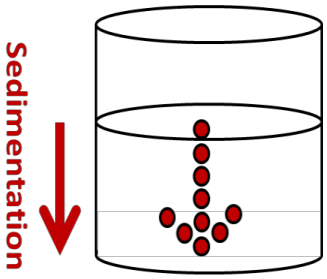


15

Sedimentation and suspension



- The **velocity of sedimentation** is given by **Stokes' Law**:

$$V = \frac{2a^2 g(\sigma - \rho)}{9\eta}$$

a = the radius of the solid particles; طردي

σ = the density of the solid; طردي

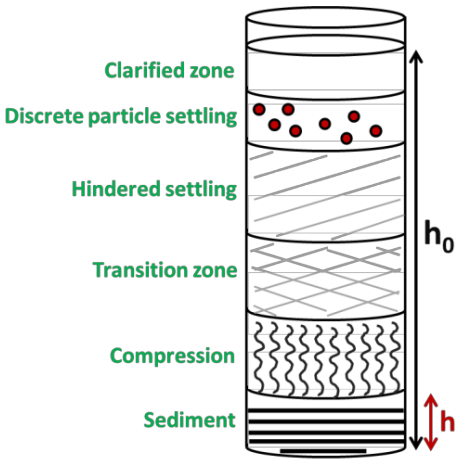
ρ = the density of the liquid; عكسي

η = the viscosity of the liquid; عكسي

g = the acceleration due to gravity. ثابت $= 9.8\ m/s$

16

The sediment ratio



Sediment ratio, R:

$$R = \frac{\text{Volume of sedimented layer } (V_s)}{\text{Total suspension volume } (V_t)}$$

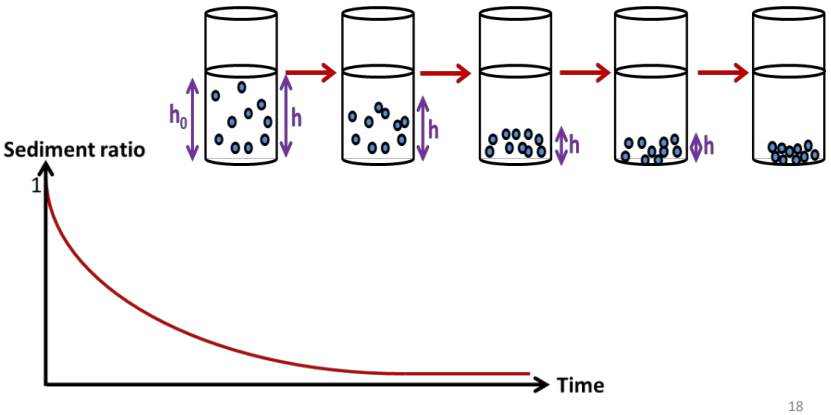
Or,

$$R = \frac{\text{Height of sedimented layer } (h)}{\text{Initial height of suspension } (h_0)}$$

17

The sediment ratio

$$R = \frac{\text{Height of sedimented layer } (h)}{\text{Initial height of suspension} (h_0)}$$

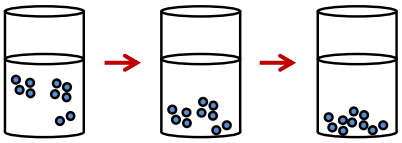


18

ربّي إني لما أنزلت إليّ من خير فقير

Flocculation

- In a **flocculated system**, the aggregates settle quickly. This leads to liquid entrapment in the sediment, which tends to be fairly easy to redisperse.



- So, in pharmaceutics, flocculated suspensions are better then deflocculated ones (why do you think this is?)!

27

Flocculated *vs.* deflocculated

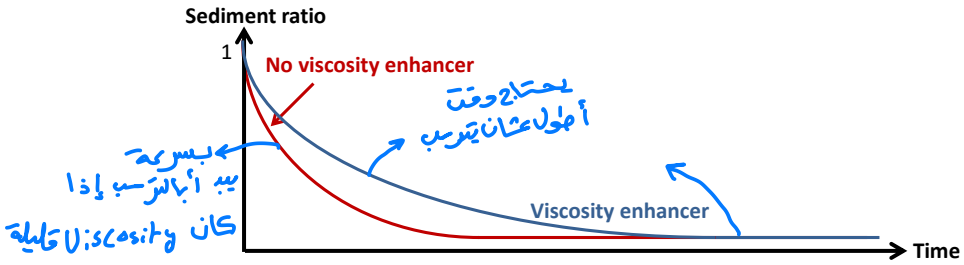
Flocculated system	Deflocculated systems
Loose **aggregates** of particles	Particles exist as **discrete units**
Large volume of final sediment	Small volume of final sediment
Rapid sedimentation rate	Slow sedimentation rate
Suspension clears quickly	Suspension remains cloudy for a prolonged period of time
Entrapment of liquid within sediment	Liquid entrapment in the sediment is prevented
Easy to redisperse sediment	Difficult to redisperse sediment

28

لا إله إلا أنت سبحانك إني كنت من الظالمين

Viscosity enhancing agents

$$R = \frac{\text{Height of sedimented layer (h)}}{\text{Initial height of suspension } (h_0)}$$



31

Viscosity enhancing agents

Examples of viscosity enhancing agents include:

- **Polysaccharides** (acacia, alginates, tragacanth, starch, xanthum gum).
- **Celluloses** (methylcellulose, hydroxyethylcellulose, sodium carboxymethylcellulose).
- **Hydrated silicates** (bentonite, magnesium aluminium silicate).
- **Carbomers** and **silicon dioxide** (Aerosil).

32