Sedimentation during Centrifugation

Derivation & Interpretation of the Svedberg Equation

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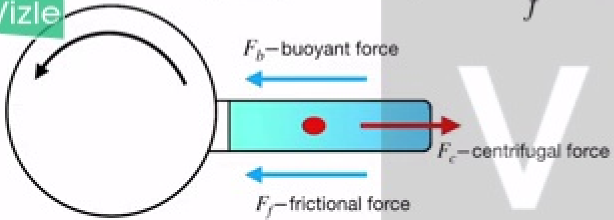
The Svedberg Equation

$$s = \frac{m(1 - \bar{v}\rho)}{f}$$



$$F_c - (F_b + F_f) = 0$$

The Svedberg Equation

$$s = \frac{m(1 - \bar{v}\rho)}{f}$$

$$F_c = m \cdot \omega^2 r - F_b = m_{dist} \cdot \omega^2 r - F_f = f \cdot v = 0$$

$$m_{dist} = m \cdot \frac{\rho_{fluid}}{\rho_{particle}} = m \cdot \rho\bar{v}$$

$$\bar{v} = \frac{1}{\rho_{particle}}$$

$$m\omega^2 r - m\rho\bar{v}\,\omega^2 r - f \cdot v = 0$$

$$m\omega^2 r(1 - \rho\bar{v}) = f \cdot v$$

$$\frac{m(1 - \rho\bar{v})}{f} = \frac{v}{\omega^2 r} = S$$

Sedimentation Coefficient vs Shape

$$s = \frac{m(1 - \bar{v}\rho)}{f}$$

- The shape of particle affects to its sedimentation speed
- More spherical particles have lower frictional coefficient (f) values that a less spherical particles of equal mass.

Sedimentation Coefficient vs Particle's Density

$$s = \frac{m(1 - \bar{v}\rho)}{f}$$

- More dense particles move quicker than a less dense ones