

2021

Calculation task № 22

Determine the sedimentation rate of liquid in the gas stream for the following data: the diameter of particles is 0.0001 m, the density of liquid is 875 kg/m³, the density of gas under conditions of separation is 28.5 kg/m³, the dynamic viscosity of gas is 0.034 mPa·s.

Data :

$$d_p = 0.0001 \quad \text{m}$$

$$\mu_g = 0.034 \quad \text{mPa}\cdot\text{s}$$

$$\rho_L = 875 \quad \text{kg/m}^3$$

$$\rho_{g.s.} := 28.5 \quad \text{kg/m}^3$$

Determine : $V_{\text{sed}} = ?$

Solution

Sedimentation rate of liquid in the gas stream :

$$V_{\text{sed}} = \frac{d_p^2 \cdot (\rho_L - \rho_{g.s.}) \cdot g}{18 \cdot \mu_g} = \frac{0.0001^2 \cdot (875 - 28.5) \cdot 9.81}{18 \cdot 0.034 \cdot 10^{-3}} = 0.136 \quad \frac{\text{m}}{\text{s}}$$

$$\text{Answer :} \quad V_{\text{sed}} = 0.136 \quad \frac{\text{m}}{\text{s}}$$