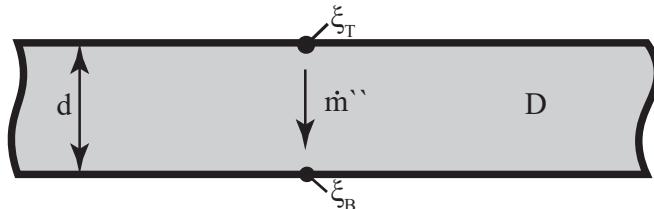


SECTION V

Mass transfer exercises**Exercise V.1: (Wet wood ★★)**

The mass fraction of water at the top of an indefinitely wide wooden plate is ξ_T . A Mass flux \dot{m}'' of water is passing through the wood each second and is led away at the bottom.

**Given parameters:**

- Coefficient of diffusion of water in wood: $D = 1.2 \cdot 10^{-9} \frac{\text{m}^2}{\text{s}}$
- Total density of the moist wood: $\rho = 650 \text{ kg/m}^3$
- Thickness of the wooden plate: $d = 0.1 \text{ m}$
- Mass fraction of water at the top: $\xi_T = 0.2$
- Led away water mass flux: $\dot{m}'' = 1.4 \cdot 10^{-6} \text{ kg/m}^2\text{s}$

Hints:

- Assume that the total density ρ of the moist wood is constant.
- Assume steady-state one-dimensional mass transport in the direction of the thickness of the wooden plate.

Tasks:

- a) Sketch the mass fraction profile within the wet wood.
- b) Determine the value of the mass fraction ξ_B at the bottom of the plate.
- c) Derive the mass fraction distribution within the wet wood from the mass transport equation.