

Summary:

Conductive heat transfer is the exchange of energy through the direct interaction between molecules of a substance containing a temperature difference. It occurs in gases, liquids or solids and has a strong foundation in the theory of physical molecular dynamics.

Question:

$L=0.4\text{m}$, $A=20\text{ m}^2$, $\Delta T=25\text{K}$, and $k=0.78\frac{\text{W}}{\text{mK}}$, find the rate of heat transfer through the wall.

Answer:

$$(1) \dot{Q} = kA \frac{\Delta T}{L} = 0.78 \frac{\text{W}}{\text{mK}} \times 20 \text{m}^2 \times \frac{25\text{K}}{0.4\text{m}} = 975\text{W}$$

$$(2) R_{\text{wall}} = \frac{\Delta T}{L} = \frac{0.4\text{m}}{0.78 \frac{\text{W}}{\text{mK}} \times 20 \text{m}^2} \approx 0.0256 \frac{\text{K}}{\text{W}}$$

$$\dot{Q} = \frac{\Delta T}{R_{\text{wall}}} = \frac{25\text{K}}{0.0256 \frac{\text{K}}{\text{W}}} \approx 976.6\text{W}$$