



HEAT GENERATION IN A SOLID

Many practical heat transfer applications involve the conversion of some form of energy into *thermal energy* in the medium.

Such mediums are said to involve internal *heat generation*, which manifests itself as a rise in temperature throughout the medium.

Some examples of heat generation are

- *resistance heating* in wires,
- exothermic *chemical reactions* in a solid, and
- *nuclear reactions* in nuclear fuel rods

where electrical, chemical, and nuclear energies are converted to heat, respectively.

Heat generation in an electrical wire of outer radius r_o and length L can be expressed as

$$\dot{e}_{\text{gen}} = \frac{\dot{E}_{\text{gen, electric}}}{V_{\text{wire}}} = \frac{I^2 R_e}{\pi r_o^2 L} \quad (\text{W/m}^3)$$

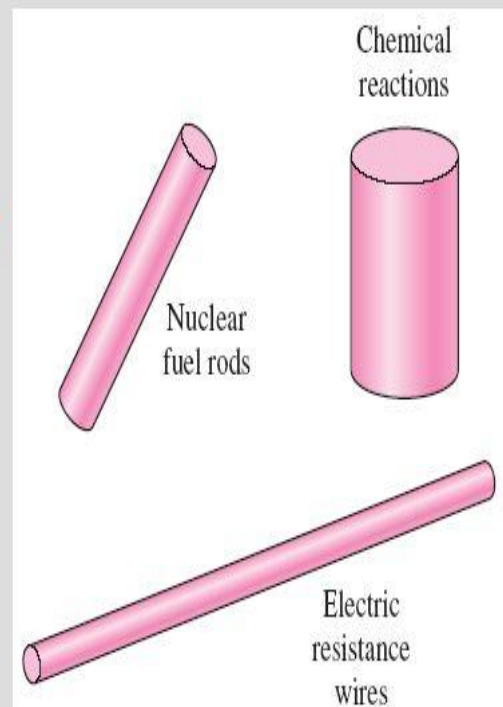


FIGURE 2-53

Heat generation in solids is commonly encountered in practice.