

Influence of Fiber Orientation and Concentration

16.8 This problem calls for us to compute the longitudinal tensile strength and elastic modulus of an aramid fiber-reinforced polycarbonate composite.

(a) The longitudinal tensile strength is determined using Equation 16.17 as

$$\begin{aligned}\sigma_{cl}^* &= \sigma_m'(1 - V_f) + \sigma_f^* V_f \\ &= (35 \text{ MPa})(0.55) + (3600)(0.45) \\ &= 1640 \text{ MPa} \quad (238,000 \text{ psi})\end{aligned}$$

(b) The longitudinal elastic modulus is computed using Equation 16.10a as

$$\begin{aligned}E_{cl} &= E_m V_m + E_f V_f \\ &= (2.4 \text{ GPa})(0.55) + (131 \text{ GPa})(0.45) \\ &= 60.3 \text{ GPa} \quad (8.74 \times 10^6 \text{ psi})\end{aligned}$$