

14.8 (a) For chlorinated polyethylene, we are asked to determine the weight percent of chlorine added for 8% Cl substitution of all original hydrogen atoms. Consider 50 carbon atoms; there are 100 possible side-bonding sites. Ninety-two are occupied by hydrogen and eight are occupied by Cl. Thus, the mass of these 50 carbon atoms, m_C , is just

$$m_C = 50(A_C) = (50)(12.01 \text{ g/mol}) = 600.5 \text{ g}$$

Likewise, for hydrogen and chlorine,

$$m_H = 92(A_H) = (92)(1.008 \text{ g/mol}) = 92.74 \text{ g}$$

$$m_{Cl} = 8(A_{Cl}) = (8)(35.45 \text{ g/mol}) = 283.60 \text{ g}$$

Thus, the concentration of chlorine, C_{Cl} , is determined using a modified form of Equation 4.3 as

$$\begin{aligned} C_{Cl} &= \frac{m_{Cl}}{m_C + m_H + m_{Cl}} \times 100 \\ &= \frac{283.60 \text{ g}}{600.5 \text{ g} + 92.74 \text{ g} + 283.60 \text{ g}} \times 100 = 29.0 \text{ wt\%} \end{aligned}$$

(b) Chlorinated polyethylene differs from poly(vinyl chloride), in that, for PVC, (1) 25% of the side-bonding sites are substituted with Cl, and (2) the substitution is probably much less random.