Example 5.1.1

Calculate the transmittance of two covers of nonabsorbing glass at normal incidence and at 60°.

Solution

At normal incidence, $r = \left(\frac{n-1}{n+1}\right)^2$ → reflectance of one interface

$$r(0) = \left(\frac{1.526-1}{1.526+1}\right)^2 = \left(\frac{0.526}{2.526}\right)^2$$

$$r(0) = 0.0434$$

From $\tau_{rN} = \frac{1}{2}\left(\frac{1-r_{\parallel}}{1+(2N-1)r_{\parallel}} + \frac{1-r_{\perp}}{1+(2N-1)r_{\perp}}\right)$, with both polarization components equal, the transmittance is

$$\tau_r(0) = \frac{1-0.0434}{1+3(0.0434)} = 0.85$$

The reflectances of one interface for each component of polarization are 0.185 and 0.001. The transmittance is

$$\tau_r(60) = \frac{1}{2}\left[\frac{1-0.185}{1+3\cdot(0.185} + \frac{1-0.001}{1+3(0.001)}\right]$$

$$\tau_r(60) = 0.76$$

The solar transmittance of nonabsorbing glass, having an average refractive index of 1.526 in the solar spectrum.