

35. Light reflected from the front surface of the coating suffers a phase change of π rad while light reflected from the back surface does not change phase. If L is the thickness of the coating, light reflected from the back surface travels a distance $2L$ farther than light reflected from the front surface. The difference in phase of the two waves is $2L(2\pi/\lambda_c) - \pi$, where λ_c is the wavelength in the coating. If λ is the wavelength in vacuum, then $\lambda_c = \lambda/n$, where n is the index of refraction of the coating. Thus, the phase difference is $2nL(2\pi/\lambda) - \pi$. For fully constructive interference, this should be a multiple of 2π . We solve

$$2nL \left(\frac{2\pi}{\lambda} \right) - \pi = 2m\pi$$

for L . Here m is an integer. The solution is

$$L = \frac{(2m+1)\lambda}{4n} .$$

To find the smallest coating thickness, we take $m = 0$. Then,

$$L = \frac{\lambda}{4n} = \frac{560 \times 10^{-9} \text{ m}}{4(2.00)} = 7.00 \times 10^{-8} \text{ m} .$$