Thin Film Interference

on a bubble, many colors can be seen on the surface due to the thin film interaction between the bubble an the light.

light refracts when it passes from one medium to another. some light is also reflected off the surface (both external and internal surfaces)

when a wave passes **into** a slower medium, the partially reflected ray is inverted. This does not occur when passing from slow to fast.

some of the light is reflected off the internal media boundary and refracts through the top. At this point it can interfere with the light reflected off the top boundary which forms a resulting wave

sometimes they will interfere destructively which will form a different color that when they interfere constructively

$$d \approx t$$

the distance traveled by the light in the slow medium,is equal to the distance between the two mediums. if $t = \lambda/2$ then internally reflected light must travel λ further than the externally reflected light. This means tha the light will be completely in phase.

if $t = \lambda/4$ then internally reflected light must travel $\lambda/2$ further than the externally reflected light.

depending on the thickness of the film, and the wavelength of light, different colors will be produced, such that some light will be in phase, and some will be out of phase

frequencies must match from one medium to another, but velocity of the wave changes. What is the mathematical relationship between the index of refraction and wavelength

what is the minimum thickness of a thin film n=1.7 needed to form maximum brightness for green light $\lambda = 550nm$?

minimum thickness for constructive interference is @ $t = \frac{\lambda_2}{2}$

i) convert λ for t = 1

$$\frac{n_1}{n_2}\lambda_1 = lambda_2$$

$$\lambda_2 = 323.53nm$$

ii) determine t

$$t = \frac{\lambda}{2}$$
$$t = 161.8nm$$

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read 10.5

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