

Reflection and Refraction 4.3

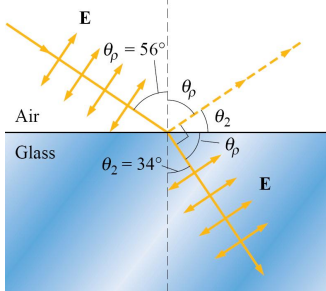
Reflection and Polarization
Polarization by scattering

Polarization by reflection

- Unpolarized light can be polarized by reflection at an angle from a dielectric surface.
- The reflected light is completely polarized at a special angle "Brewster's angle"
- If the incident light is polarized with the E field in the plane of incidence, then at Brewster's angle no light is reflected. All the light is transmitted.

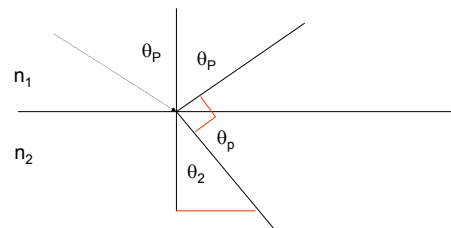
Reflection and refraction

The Incident light is polarized in the plane of incidence.
(plane of the picture)



When the sum of $\theta_2 + \theta_p = 90^\circ$ the intensity of the reflected light is zero. At this angle the E field of the light in the glass is parallel to the direction of the reflected wave, therefore cannot propagate in that direction.
=> No Reflection
Total Transmission.

Brewster's angle Polarizing angle



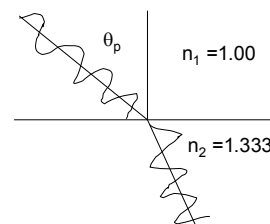
Snell's law $n_1 \sin \theta_p = n_2 \sin \theta_2$
 $\sin \theta_2 = \cos \theta_p \Rightarrow \tan \theta_p = \frac{n_2}{n_1}$

Question

Suppose you wanted to have a polarized light beam to be completely transmitted at the air-water interface. What conditions would you use?

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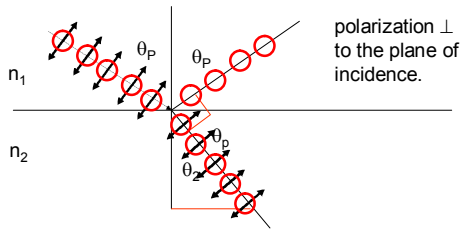


Light with E field in the plane of incidence
Angle of incidence equal to the polarizing angle

$$\tan \theta_p = \frac{n_2}{n_1} = 1.333$$

$$\theta_p = 53^\circ$$

Unpolarized light incident at the polarizing angle is polarized on reflection

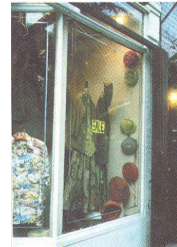


polarization \perp
to the plane of
incidence.

Polarization by reflection



no filter



polarizing filter