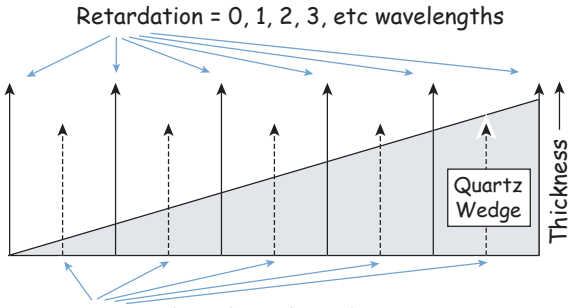
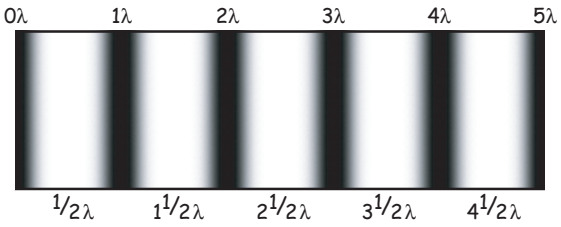
LECTURE FIVE: Monochromatic vs Polychromatic Illumination

IN THIS LECTURE
- Monochromatic illumination and the Quartz Wedge
- Polychromatic illumination
- The Michel Levy Chart
- Anomalous Interference Colors

MONOCHROMATIC LIGHT

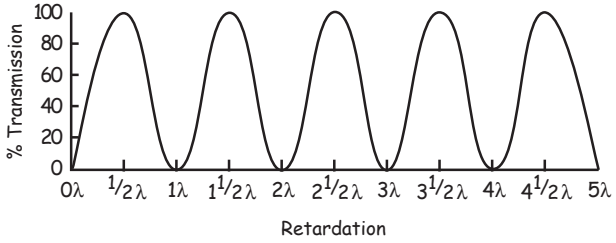
If our sample is wedged shaped, instead of flat, the thickness of the sample and the corresponding retardation will vary along the length of the wedge.





If we look at this wedge under crossed polars using monochromatic light we see an image that looks like…

- dark areas where retardation is a whole number of wavelengths.
- light areas where the two rays are out of phase,
- brightest illumination where the retardation of the two rays is such that they are exactly ½, 1½, 2½ wavelengths and are out of phase.



The percentage of light transmitted through the upper polarizer is a function of the wavelength of the incident light and retardation

If a mineral is placed at 45° to the vibration directions of the polarisers the mineral yields its brightest illumination and percent transmission (T).

POLYCHROMATIC LIGHT

Polychromatic or White Light consists of light of a variety of wavelengths, with the corresponding retardation the same for all wavelengths.

Due to the different wavelengths, some rays reach the upper polar in phase and are cancelled, others are out of phase and are transmitted through the upper polar. Remember partial interference…

The combination of wavelengths which pass the upper polar produces the interference colours, which are dependant on the retardation between the fast and slow rays.

At the thin edge of the wedge the thickness and retardation are ~ 0, all of the wavelengths of light are cancelled at the upper polarizer resulting in a black colour.

With increasing thickness (increasing retardation), the interference colour changes from black to grey to white to yellow to red and then a repeating sequence of colours from blue to green to yellow to red. The colours get paler, more washed out with each repetition.

The interference colour produced is dependant on the wavelengths of light which pass the upper polar and the wavelengths which are cancelled.