



NICOL PRISM

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Nicol Prism

Nicol prism is an optical device for producing and analysing plane polarised light .

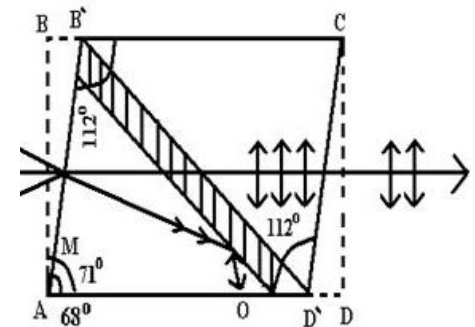
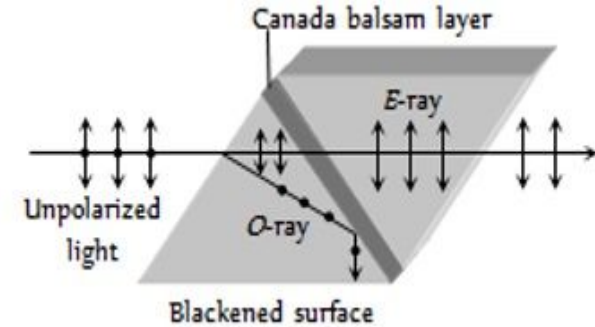
When ordinary light is incident on the Nicol Prism , it splits up into ordinary and extraordinary rays . These two are completely plane polarised with vibrations in mutually perpendicular planes . In Nicol prism , ordinary beam is reflected by total internal reflection.

Construction :

It consists of a calcite crystal whose length is about three times its breadth. The end faces of the crystal are grounded in such a way that the angles in the principle section becomes 68° and 112° instead of 71° and 109° .

The crystal is then cut into two portions by a plane perpendicular to the principle section and passing through BD. The two cut surfaces are grounded and then cemented together with **Canada Balsam**.

Canada Balsam is transparent substance having refractive index in between the refractive indices of ordinary and extraordinary rays. This is known as **Nicol Prism**. The sides of prism are coated with black paint.





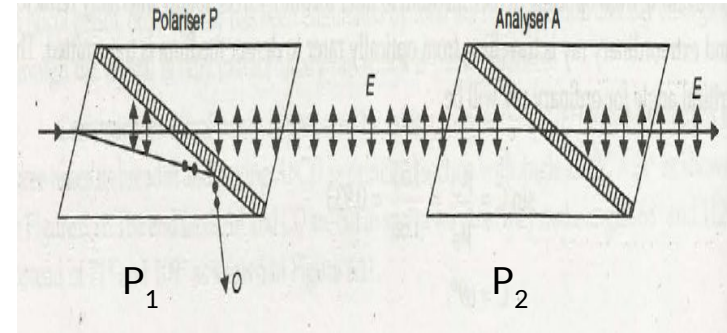
Action:

When a ray of light enters the face AB it splits up into O-ray and E-ray. The refractive indices for O-ray, Canada Balsam, E-ray are 1.66, 1.55, 1.48 (per sodium light) respectively. So ordinary ray travels from denser medium to rarer medium (Canada Balsam). When the angle of incidence is greater than critical angle (i.e. 69°), then total internal reflection takes place. Hence the ordinary ray is observed as black. The E-ray travels straight and emerges out of the prism. This E-ray coming out of the Nicol-prism is plane polarised. Thus the Nicol prism produces plane polarised light. Hence it is called as Polariser.

Nicol Prism as an Analyser:

Nicol prism can be used for the production and detection of plane polarised light. When two Nicol prisms P_1 and P_2 are placed adjacent to each other as shown in figure, one of the them (P_1) acts as polariser and other as an analyser.

If the 2nd prism is gradually rotated , the intensity of E-ray decreases when they are perpendicular to each other, intensity of the emergent screen is zero.



It means light coming out of P_1 is plane polarised. When the polarised E-ray enters the prism P_2 , it acts as an O-ray and is total internally reflected by Canada balsam.

So no light comes out of P_2 . Therefore, P_1 produces plane polarised light and P_2 detects it. Hence P_1 and P_2 are called Polariser and Analyser resp.. The combination of P_1 and P_2 is called a **Polariscope**.

