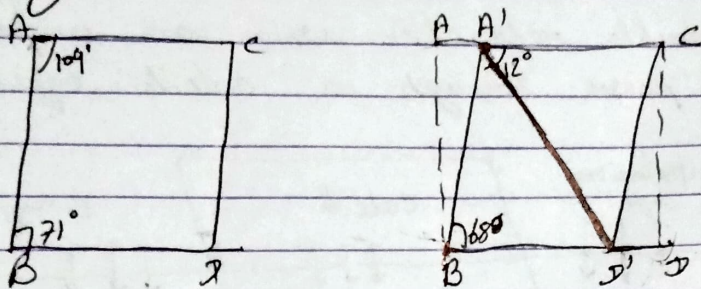


construction of Nicol Prism \rightarrow

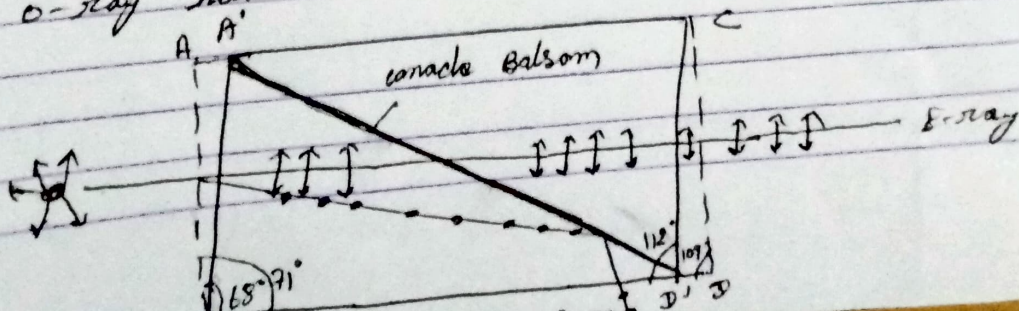
The Nicol prism is made by taking a rhombohedron of calcite crystal whose length is 3 times of its thickness. ABCD represents principal section of crystal with $\angle ABD = 71^\circ$ & $\angle BAC = 109^\circ$. The end faces AB & CD are cut or polished in such a way that these angle become 68° & 112° respectively, so that these faces changes into BA' & CD' respectively



The resulting crystal is then cut apart into 2 pieces along A'D'. These 2 pieces are then joined together with a special transparent glue called Canada Balsom having $\mu_{ob} = 1.55$ & $\mu_o = 1.658$ $\mu_e = 1.486$. The lower side BD' is coated with lamp black

Working \rightarrow

When an unpolarized ray of light SM is allowed to enter Nicol prism from left face A'B it suffers double refraction & give rise to o-ray MN & e-ray ME. Both these rays are plane polarized & are \perp to each other. The e-ray have vibration in plane of paper & o-ray have vibrations \perp to plane of paper



Canada Balsam ($\mu_{CB} = 1.55$)

$$\mu_o = 1.658, \mu_E = 1.486$$

$$c = \sin^{-1} \left(\frac{\mu_{CB}}{\mu_o} \right)$$

$$c = \sin^{-1} \left(\frac{1.55}{1.658} \right)$$

$$c = 69^\circ$$

The O-ray is travelling from optically denser medium (calute $\mu_o = 1.658$) to an optically rarer medium (Canada Balsam $\mu_{CB} = 1.55$) & will suffer TIR provided angle of O-ray at Canada Balsam layer is greater than critical angle (c) 69° . This totally internally reflected is then absorbed by black block coated on side BD' of crystal.

The E-ray is travelling from optically rarer medium (calute $\mu_E = 1.486$) to an optically denser medium (Canada Balsam $\mu_{CB} = 1.55$) & will not suffer TIR & so it remain unaffected & is transmitted from right end CD' of prism. In this Nicol prism eliminates O-ray & provides only E-ray which is polarized.

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