EXPERIMENT NO.3

Determination of wavelength of sodium light using Newton's rings method.

INTRODUCTION: When the interference of light occurs in the air between a plane glass plate and a plano-convex lens of large focal length, the fringes formed are circular. These ring-shaped fringes are called Newton's rings. These are alternate bright and dark rings with a central spot which is dark in reflected light. (Fig. 1). For purposes of measurement, the observations are usually made at normal incidence by an arrangement such as that shown in Fig.2., where the glass plate, G, reflects the light down on the plates. A low-powder microscope, M, focused on the air-firm shows a series of Newton's rings. Measuring diameters of these rings and using equation (1), the wavelength of light (sodium light here) can be determined.

FORMULA EMPLOYED

Wavelength of light used,

$$\lambda = (D^2_{n+p} - D^2_n) / 4pR \qquad\qquad (1)$$

where n = order of the ring
   R = radius of curvature of plano-convex lens
   p = ring's difference

EXPERIMENTS PROCEDURE :

Switch on sodium light and wait till it attains its characteristic yellow colour. Allow sodium light to fall on assembly of plane glass plate and plano-convex lens as shown in Fig. 2. Then the latter is .so set that the Newton's rings become visible in the field of view of the microscope and the point of intersection of the cross-wires coincides with the centre of the central spot. Newton's rings can be made distinct., using the rack and pinion arrangement attached to the microscope.

Next, the perpendicular cross-wire is moved to 15th bright ring (say) on any of the side and then brought back to the 9th bright ring without taking reading at the 15th ring to avoid backlash error, if any. The cross-wire is then set at the middle of the 9th, 6th and 3rd bright rings on this side in succession and corresponding observations are recorded. Then move the cross-wire to the other side and record observations for the same bright rings starting with 3rd ring and moving to the 9th ring. Determine diameters of these rings taking difference of the readings of the corresponding rings on either side of the central spot.

Make a suitable table to record above observations and determine the wavelength of sodium light using eq. (1).

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