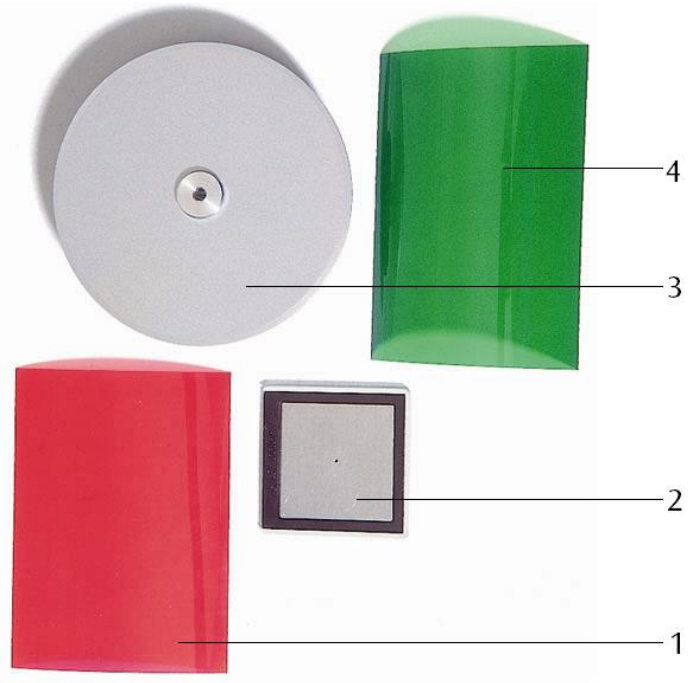
Optical Equivalent to Debye-Scherrer Interference
1000656

Instruction sheet

10/15 ALF



1 Colour filter, red
2 Pinhole aperture slide
3 Disc with cross lattice
4 Colour filter, green

1. Description

The Optical Equivalent allows an experiment that models the Debye-Scherrer effect as seen in the electron deflection tube using visible light.

The equipment set comprises an aluminium disc mounted on a hollow shaft which rotates in a ball-race inside a plastic holder. Located in the bore of the shaft is a cross lattice. The rotating disc serves as a model of a polycrystalline structure such as the carbon grating in the electron deflection tube. The set also contains a pinhole aperture in a slide frame, one red and green plastic colour filter.

2. Technical data

Cross lattice:	20 lines/mm, 3 mm diam.
Disc:	100 mm diam.
Pinhole aperture:	1 mm diam.
Aperture frame:	50 mm x 50 mm
Colour filter:	80 mm x 100 mm

3. Operation

3.1 Set-up

To perform the experiment the following equipment is also required:

1	optical lamp	1003188
1	transformer 12 V (@230 V)	1000593
or		
1	transformer 12 V (@115 V)	1006780
1	tube holder D	1008507
1	convex lens,f = 100 mm	1003023
1	object holder on stem	1000855
1	projection screen	1000608
1	tripod base	1002835
3	barrel foot	1001046

- Set up the experiment as in Fig. 1.
- Insert the aluminium disc into the tube holder from the rear.
- Mount the pinhole aperture slide on the object holder and position it close to the lamp.
- Adjust the height of the components so that the light beam passes through the cross lattice.

3.2 Procedure

- Perform the experiment using white light in a darkened room
- Vary the distance between the pinhole aperture and the lens until the diffraction pattern is visible on the screen.
- First study the diffraction pattern when the grid is not moving.

The diffraction pattern is similar to that of an electron beam diffracted through a polycrystalline graphite lattice where all atoms are equally spaced.

- Then rotate the disc rapidly.

The rotating grid simulates diffraction of an electron beam at a graphite lattice with a more or less random distribution of atoms.

The way that the diffraction pattern depends on the wavelength can easily be demonstrated with the help of coloured filters. The diameter of the diffraction rings gets smaller as the wavelength decreases from red to green.

- Hold the colour filters close to the pinhole aperture.

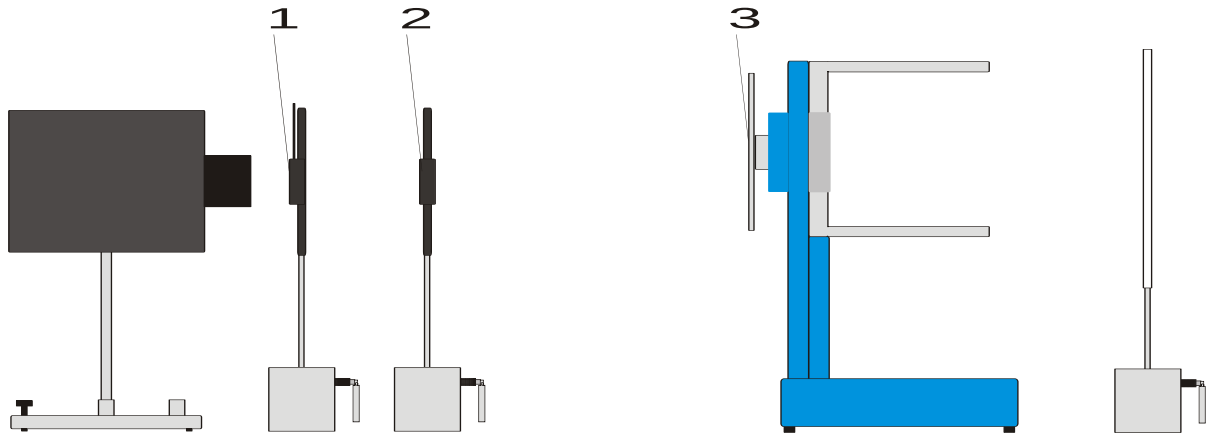


Fig. 1 Experiment set-up, 1 pinhole aperture slide, 2 lens, 3 aluminium disc