

12.108 Lab#16 Optics IV - Biaxial Minerals

November 18, 2004

1. Optic interference figure for muscovite: Obtain an interference figure for the muscovite Bxa oriented thin section (or use an unmounted sample)

a) What is the optic sign of muscovite?

b) Produce one colored diagram of the interference figure with the accessory plate in with the optic plane oriented NE-SW. On the diagram label the optic plane, the optic axis, and the vibration directions for the α' , β and γ' rays in each quadrant.

b) Using a centered Bxa figure or an Optic Axis figure, determine the value of $2V$ for muscovite.

2. Optic interference figure for augite: Obtain an interference figure for the augite Bxa oriented thin section

a) What is the optic sign of augite?

b) Produce one colored diagram of the interference figure with the accessory plate in with the optic plane oriented NE-SW. Label the optic plane, the optic axis, and the vibration directions for the α' , β and γ' rays in each quadrant.

d) Using a centered Bxa figure, determine the value of $2V$ for augite.

3. Optic interference figure for andalusite: Obtain an interference figure for the andalusite Bxa and Bxo oriented thin sections

a) What is the optic sign of andalusite.

b) Draw the optical indicatrix for andalusite, showing its orientation with respect to crystallographic axes and major crystallographic planes.

4) Recognition of minerals in hand-sample and thin-section - Hand sample I1-030 and Associated thin section (same as uniaxial samples)

a) describe k-feldspar in the hand sample

b) Using all the skills you've learned (color, crystal symmetry, cleavage, optical properties, etc.) distinguish k-feldspar in the thin section. Draw a view of the thin section noting k-feldspar (and any other minerals you may recognize)

c) describe the d-feldspar (color, crystal symmetry, cleavage, optical properties, etc.) in the thin section

d) what percentage of the thin section is k-feldspar.

Methods for obtaining optic interference figures and the determination of optic sign and 2V for biaxial minerals:

1. *Optic axis interference figure* : the type of interference figure exhibited by a biaxial crystal depends on the crystal orientation with respect to the stage. The Bxa figure is the easiest figure to determine the two critical parameters, sign and 2V.

Fig. 10-2

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2. *Optic sign of mineral (positive or negative)*: Obtain a good Bxa interference figure. Insert the quartz accessory plate into the microscope and observe the changes in colors of interference rings in the figure. Interpretation of this effect can be made according to the diagrams below, which represent a modified version of figures 11.33 and 11.35 in Zoltai and Stout.

a) Optically positive minerals: If the Z-axis, parallel to the slowest vibration direction (ϵ), coincides with the acute bisectrix (Bxa), the effect of this quartz plate will be additive with respect to interference colors which lie between the isogyres, and subtractive outside them.

b) Optically negative minerals: If the X-axis, parallel to the fastest vibration direction (ω), coincides with the acute bisectrix (Bxa), the effect of this quartz plate will be subtractive with respect to interference colors which lie between the isogyres, and additive outside them.

3. Measurement of 2V: Obtain an OA interference figure and compare the curvature of the isogyre to this figure (or see figures 11.34 and 11.36 in Zoltai and Stout)