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ELECTRON PROBE MODIFICATIONS USING POLARIZED LIGHT FOR MINERALOGICAL GRAIN EXAMINATION

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A Philips AMR/3 electron-probe microanalyzer has been used to determine the chemical composition of individual grains in plagioclases. For this use the microanalyzer was modified to enable thin transparent mineralogical specimens to be viewed in transmitted polarized light while in position under the electron beam ; thereby bringing out the grain structure.

A sketch of the general arrangement of the specimen and optical system is shown in Figure 1. A 400 watt source of white light with a system of lenses was used to produce a collimated beam. To direct this beam through the system of polarizer, sample and analyzer, an inclined plane mirror was placed directly under the focusing piston as shown. The light source and the mirror were adjusted to obtain maximum light intensity at the eye-piece. The analyzer, which was attached to the eye-piece, could be rotated to bring the desired grain into view.

[1] Issued as AECL No. 338/70.

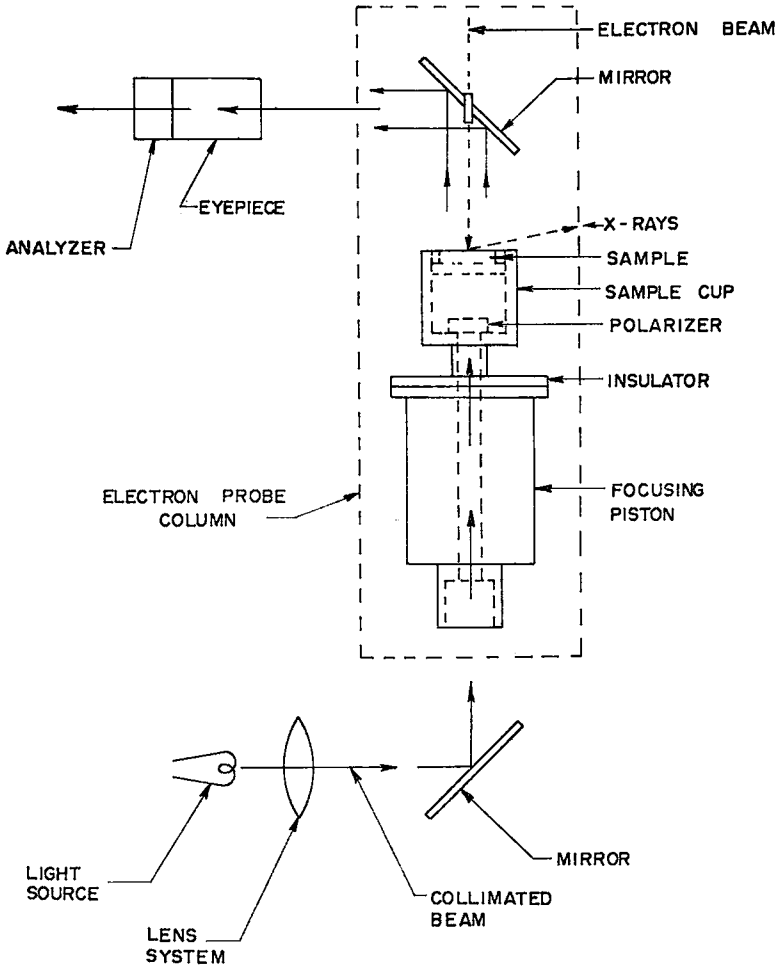

FIGURE 1. DIAGRAM SHOWING THE ASSEMBLY OF THE COMPONENTS USED IN ANALYZING MINERALOGICAL SAMPLES

The original focusing piston was replaced by the one shown in Figure 2. The overall dimensions are unchanged but a 3/8 inch diameter hole was drilled along its axis to allow for the passage of the light beam. The glass window and the "O" ring seal are necessary to maintain the system under a vacuum. A Teflon split ring keeps the window from

dropping out when the system is at atmospheric pressure. A 1/8 inch thick lucite disc with a 3/8 inch hole at its centre was glued to the top of the focusing piston to provide electrical insulation.

The original sample cup was replaced by the one shown in Figure 3 and having the same external dimensions. The polarizer was placed over the hole at the bottom of the sample cup and fastened with double-sided Mystik tape.

The specimen (in this case a plagioclase) is shown at the upper end of the sample cup. It was made 1/16 in. thick and had both surfaces polished with 1μm diamond compound until both surfaces were smooth and clear. The specimen was then glued onto a 1 in. diameter disc of lucite 3/16 in. thick of which the sides were flat, parallel to each other and highly polished. A thin layer of carbon (~200Å) was evaporated onto the sample and lucite to provide electrical conductivity and the

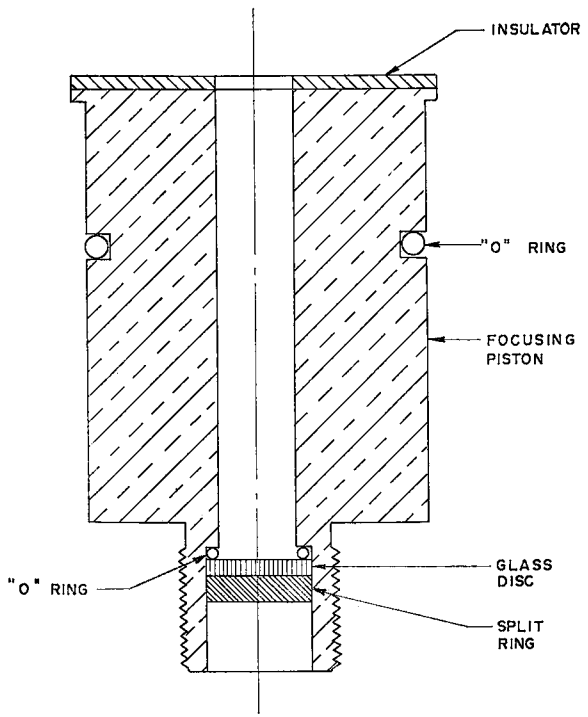

FIGURE 2 FOCUSING PISTON

assembly mounted in the sample cup with set screws as shown in Figure 3. The assembly of specimen, sample cup and the focusing piston were installed and the analysis carried out in the normal manner.

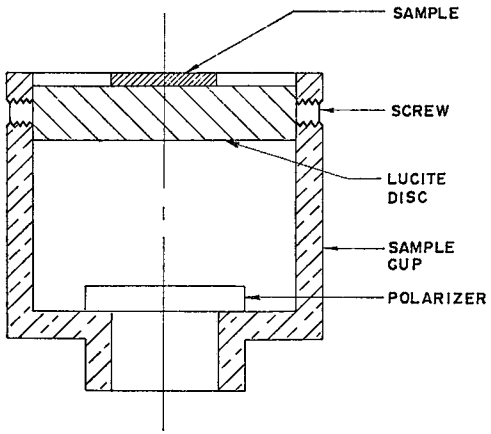

FIGURE 3. SAMPLE CUP AND SAMPLE

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