edges will usually suffice to level the section and keep it in crisp focus at magnifications as high as 600 diameters.

It is advisable to check focus periodically during long scans. However, only occasional further adjustments should be required.

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A STAINING METHOD FOR DISTINGUISHING PARAGONITE FROM MUSCOVITE IN THIN SECTION

D. M. LADURON,[1] *Laboratory of Petrography, Louvain University, Belgium.*

ABSTRACT

Sodium cobaltinitrite can be used to stain muscovite, to distinguish it from paragonite. The stain is inhibited in the neighbourhood of feldspar crystals.

Everyone who has worked with paragonite-schists knows the difficulty of distinguishing paragonite from accompanying muscovite (either pure, or phengitic muscovite). The following procedure, which has been tested on paragonite-schists and -gneisses from Gassetts (Vermont, U.S.A.) and Vanzone (Italian Alps) and checked under the microprobe, will be helpful in this respect. It derives from the now classical method for potassium feldspar, reviewed and slightly modified by Laduron (1966).

REAGENTS

— Hydrofluoric acid—50 percent solution;
— Saturated solution of sodium cobaltinitrite (6 gr/10 ml) in water;
Fresh acid should be used for each batch of sections. The cobaltinitrite solution can be reused as long as it contains undissolved residue of sodium cobaltinitrite.

TECHNIQUE

1. The uncovered thin section is exposed to HF vapour for three minutes (instead of one minute for potassium feldspar) by inverting the section above a plastic box (such as an ice cube tray) half-filled with hydrofluoric acid. The operation is conducted under a fume cupboard.

[1] Address: Sint-Michielsstraat, 6, B 3000 Louvain (Belgium).

The etching box must always be covered with a plastic lid after each etching operation.

2. The thin section is removed from the etching box, placed on a plastic tray and let to dry for 2 or 3 hours, in the draught of the fume cupboard. This is done in order to allow any acid drops condensed on the surface of the section to evaporate.

3. The thin section is then immersed for four minutes in the well-mixed saturated sodium cobaltinitrite solution.

4. The thin section is thoroughly but gently rinsed in tap water.

5. The thin section is finally dried and covered in the usual manner.

Muscovite is stained yellow by this process whereas *paragonite* remains unstained. Muscovite lamellae arranged with the cleavage truncating the plane of the section take the stain better than lamellae lying parallel to the section. The yellow color is best seen in daylight or in slightly bluish light (daylight filter); the yellowish tungsten light should be avoided because it reduces the color contrast. A stronger color contrast, needed to obtain black and white photographs such as Figure 1, requires the use of a monochromatic blue filter.

Biotite is stained yellow but the staining might be irregular. *Phlogopite* should react in the same way as biotite but this has not been tested.

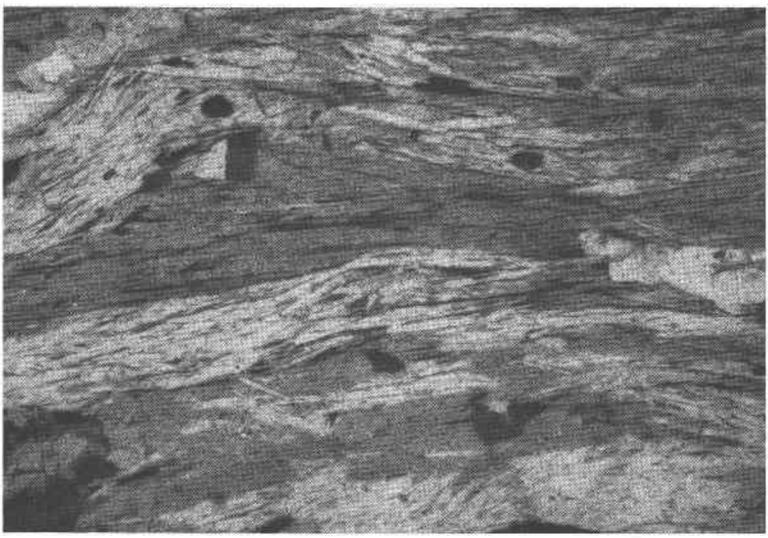

FIG. 1—Stained thin section of a garnet-muscovite-paragonite-schist from Gassetts, Vermont, photographed under blue light (Balzer interference filter: 493 mμ). Muscovite, stained yellow, appears gray; paragonite remains unstained and appears white. Field of photograph 3×2.1 mm.

Neither *margarite* nor *pyrophyllite* take the stain, but these minerals cannot be confused with paragonite.

Limitation

The limitation to the method occurs when feldspar is present in the rock. For reasons as yet unknown, the presence of a feldspar grain inhibits in some way the staining of surrounded or included muscovite; this unstained muscovite might then be erroneously identified as paragonite. The existence of this effect has been checked under microprobe using sections polished on one side and stained on the other.

Sometimes, parts only of the muscovite lamellae are stained, the unstained part forming a fringe around the feldspar. For example, if a feldspar grain is enclosed in a muscovite band, there is an unstained "aureole" the outer limit of which is independent of the outline of the muscovite lamellae. In other cases, randomly arranged patches in the muscovite lamellae remain unstained.

Sometimes also, as observed in some feldspar-rich rocks (microcline— as well as plagioclase-gneisses), all the muscovite in the rock takes a very weak stain when compared to that taken by muscovite in a feldspar-free schist of the same staining batch.

Some experience of the method will help to overcome this drawback; *e.g.* in a paragneiss with 35 percent plagioclase and 14 percent white mica, the absence of paragonite can be surmised by the fact that unstained micas only occur in contact with feldspar.

Conclusion

Despite this limitation, the described method is useful because it permits modal and textural analysis of paragonite-schists. It is better than the microprobe method (Laduron and Martin, 1969) based on the back-scattering of electrons, which is slow and limited to narrow fields of view. Diffractometry of the micas is hardly quantitative and gives no idea of textural relationships.

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