transition zone (LX B1-3), inner transition zone (LX B4-6), and luxullianite (LX 008). From the results of the partial chemical analyses shown in Table I, it may be seen that about 15% silica by weight is lost in the transition from granite to luxullianite, and that aluminium and iron constitute the main additions to the system. Based on the behaviour of K and Na, an alkali exchange mechanism is proposed, that results in a net increase in K at the expense of Na.

Acknowledgements. I am grateful to Dr. Ian L. Gibson for the use of facilities at Bedford College, London, and to Miss Giselle Marriner at Bedford College for XRF determinations. The work was carried out while I was a student at King's College, London.

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REFERENCES

Blyth (F. G. H.), 1949. *Geol. Mag.* **86,** 175-9.
Bonney (T. G.), 1877. *Mineral. Mag.* **1,** 215-21.
Exley (C. S.) and Stone (M.), 1964. In *Present Views of Some Aspects of the Geology of Cornwall and Devon* (Roy. Geol. Soc. Cornwall), 132-84.
Krynine (P. D.), 1946. *J. Geol.* **54,** 65-87.
Power (G. M.), 1968. *Mineral. Mag.* **36,** 1078-89.
Wells (M. K.), 1946. *Mineral. Mag.* **27,** 186-94.

[*Manuscript received 17 October 1977; revised 25 November 1977*]

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MINERALOGICAL MAGAZINE, JUNE 1978, VOL. 42, PP. 297-8

Improved sample preparation for fluid inclusion studies

IN a previous paper (Brumby and Shepherd, 1976) details were given of a method for preparing mineral samples for fluid inclusion studies. Subsequent work indicated that certain improvements were desirable due to the need for thinner specimens, easier polishing, and faster throughput. The method described below is based on the earlier work, and whilst retaining the same principles, has been designed to satisfy the new requirements. It is also considered to be suitably cost effective, employing inexpensive materials, one operator, and a minimum of equipment.

Method. The mineral chips to be examined are placed in 32 mm diameter silicone rubber moulds and coated with Ceemar polyester embedding resin. After this has set at room temperature, the moulds are filled with Araldite epoxy resin (MY 750/HY 956 100:20), which is allowed to harden, again at room temperature. The resulting blocks are then removed from the moulds and cured at 50 °C for at least 1 hour to reduce brittleness. Parallel-sided slices 1·0-1·5 mm thick are cut from the cooled blocks, which are supported in a purpose-designed clamp (Brumby and Shepherd, 1976) fixed to the magnetic chuck of a diamond saw. The slices are then attached to 130 mm diameter duralumin discs with low melting-point Lakeside resin (Type 30C) and ground flat on a Speedfam 12 lapping machine using 600-mesh carborundum in water. Grinding is continued until sub-surface damage (see discussion) has been removed from all slices. 1200-mesh carborundum is then substituted to provide a pre-polish finish. The required degree of polish is obtained using an optical quality felt lap, charged with zirconium oxide and water, fixed to the original steel lap. As in the grinding process, suitable weights are added to achieve optimum efficiency. The slices are then removed from the duralumin discs by heating to 50 °C on a hotplate, transferred polished side down to plate glass discs, and attached with Lakeside 30C, ground as described above to the correct thickness, polished, and again removed by warming. Finally, paper tissues are used to absorb excess Lakeside resin from the warmed slices.

Discussion. Blocking with epoxy resin is considered necessary as it offers easier handling and orientation of small specimens during sawing, and provides an ideal support for easily cleaved, soft, or friable materials.

Being readily soluble in chloroform, the polyester coating may be dissolved prior to thermometric analysis allowing stress-free removal of the polished mineral slice from its Araldite surround. The solvent also removes any traces of resin, which may later decompose at higher temperatures and

interfere with the analysis. Experiments have shown that fast cutting of the blocks causes rupturing of the inclusions adjacent to the sawn face. To minimize this sub-surface damage a cutting rate of $\leqslant 9$ mm/min using a 150 mm diameter fine diamond blade at 2000 r.p.m. is recommended for routine preparation.

All grinding and polishing processes are carried out using a basic Speedfam 12 lapping machine, with ancillary discs and felt lap designed by the authors. The former ensure that only the slices are in contact with the laps, and afford greater support than the retaining rings supplied by the manufacturer. This avoids any tendency for the thinned slices to warp or shatter.

When thinning and polishing the second face of the specimens, glass discs are substituted for the duralumin discs, allowing rapid visual monitoring of the thickness.

Water is employed as the abrasive vehicle in preference to the recommended oils, which tend to dissolve the Lakeside adhesive. During grinding it was also found that carborundum coarser than 600-mesh (9 μm average particle size) settled out in the screw feed of the Speedfam, resulting in an unpredictable grinding rate. 600-mesh carborundum was therefore selected as the best compromise in that it provided an adequate removal of material whilst requiring the use of only one finer grade before polishing.

Assuming a maximum of 9 slices per disc, loaded with a 5 kg weight, an adequate polish is achieved in approximately 1 hour. The Speedfam 12 will accept 4 discs simultaneously, and it is therefore possible to process 32 samples per run. However, this number may be increased by using smaller moulds, or by increasing the number of specimens per block. Without these refinements, an average of 12 doubly polished slices per day may be prepared.

Process time could be reduced further by employing an automatic surface grinding machine. However, these are relatively expensive, whereas the method described utilizes a modestly priced and compact machine, which can be used by an unskilled operator.

It is anticipated that future requirements will be of slices < 150 μm which will necessitate a more controlled method of thinning such as that provided by an automatic surface grinder.

A list of manufacturers and suppliers may be obtained from the authors.

Acknowledgement. We wish to thank Dr. A. H. Rankin, Imperial College, London, for providing technical data on polyester resins. This note is published by permission of the Director, Institute of Geological Sciences.

REFERENCE

Brumby (G. R.) and Shepherd (T. J.), 1976. *Mineral. Mag.* **40**, 647–8.

[*Manuscript received 15 November 1977*]

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MINERALOGICAL MAGAZINE, JUNE 1978, VOL. 42, PP. 298–300

A new wulfenite locality, near Bristol

WULFENITE has been found at a new locality, at Henbury, near Bristol (Coombe Farm quarry, G.R. 1″ sheet 156. 562778). The quarry, now disused, is opened in steeply dipping Lower Carboniferous limestone, and is notable for the occurrence of a small, podiform, replacement deposit consisting of both Mn and Fe oxides, developed in a narrow north–south-trending rubble-filled fissure in the limestone. This deposit is typical of the type of low-temperature secondary Mn–Fe mineralization found scattered throughout the Bristol district (Spencer and Mountain, 1923; Alabaster, 1975). East–west-trending calcite veinlets, carrying galena and chalcopyrite, cut the mineralized fissure. To the east of the quarry these veins thicken up and have been worked for lead in the past.

The manganese ore varies in texture, from massive, locally coarsely crystalline (pyrolusite), to soft and cindery. Colloform banding and shrinkage cracks are visible in both ore types. Polished sections of the ore suggest that much of the crystalline pyrolusite has been derived from manganite. The 'pod' is differentiated into a Mn-rich core and a Fe-rich margin.

Wulfenite is found in two distinct environments in this deposit. It is sparingly distributed through-