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LAMPROPHYRES AND INCLUSIONS FROM THE TRURO-FRANKTON AREA

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by

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Lamprophyres and Inclusions from the Truro-Frankton Area

M G FARRAND

Two specimens of lamproite from the Truro-Frankton area were examined for possible indicator minerals. A specimen from Schneider's Gossan contains apatite and one from Truro itself contains sparse rutile. Both minerals will be analysed by microprobe for diagnostic trace elements. Three samples of inclusions from the same specimen collected near DDH Frankton I were examined. Two inclusions consisted of fine grained, possibly chilled facies of lamproite incorporated in a subsequent pulse of magma precipitating coarse grained minerals. The third sample contained inclusions consisting of aggregates of coarse phlogopite flakes probably concentrated from magma carrying primary phlogopite macrocrysts.

INTRODUCTION

Two lamproites from localities 3 and 8 in the Truro-Frankton area which had not been sectioned previously were examined for their content of accessory minerals. Three sections of inclusions from a lamproite at Frankton I, locality 15, were examined to determine their provenance and their content of accessory minerals.

PETROGRAPHY

Specimen 6729 RS 3808

Rock name: Lamproite

Locality: No. 3 Truro-Frankton area, Schneider's Gossan on Pine Creek.

Hand specimen

The specimen is cut across the plane of preferred orientation of mica macrocrysts so that many flakes are displayed as thin lines. The groundmass is grey and vitreous with no prominent structure - Limonite is abundant as interstitial patches and the specimen required impregnation before it could be sectioned.

Thin section

Despite heavy limonitic alteration the rock is readily recognisable as lamproite of the Frankton II type with pale phlogopite and macrocrystal apatite. The groundmass contains abundant potash feldspar and minor plagioclase and quartz. Accessory minerals have been replaced by limonite.

Phlogopite macrocrysts are up to 2 mm long with a preferred orientation. They are mainly of the pale type, pleochroic from colourless to a yellowish brown. The flakes are strongly resorbed and often have a more biotitic margin. Optical properties are not strongly defined due to weathering. Some alteration is chloritic but most replacement is by limonite.

Apatite macrocrysts are abundant and up to 0.5 mm long. They tend to be spindle shaped with a prominent basal cleavage or parting which is often accentuated by alteration.

The groundmass is highly feldspathic with potash feldspar the dominant phase. It is completely devitrified but with optically imperfect crystals. The boundaries of individual crystals are poorly defined and clusters of radiating acicular forms exhibit an undulose extinction. Clusters are up to 1 mm long and give an appearance of coarse grain size. Weakly developed multiple twinning in a few crystals indicates the presence of minor plagioclase. Quartz is present as fine to medium grains, the former possibly primary but the latter probably filling vesicles or weathered cavities. Some of the apatite crystals are of groundmass grain size.

Accessory minerals may have been ilmenite and rutile but fine to coarse patches of limonite/leucoxene are now present as replacement products of weathering.

Comment

The rock is typical of the alkaline, phosphatic lamproites which make up one of the two suites of the Truro-Frankton province. The type specimens are those from DDH Frankton II. The rock was collected as a source of indicator minerals for diamond prospecting. Only apatite was recovered as a possible indicator.

Specimen 6729 RS 3804

Rock name — Lamproite with strong alteration.

Locality — No 8, Truro-Frankton area. Western edge of Truro.

Hand specimen

The rock is greenish grey with a preferred orientation of platy minerals. Weathering has made it crumbly enough to require impregnation before sectioning. Many cavities and patches of limonitic alteration are apparent even on the impregnated chip from which the section was cut. Little detail of the groundmass can be distinguished.

Thin section

Alteration of this rock was well advanced before it was affected by limonitic replacement from weathering. Coarse grained quartz and muscovite flakes have developed as well as patches of fine grained sericitic alteration, fine grains of quartz and limonite as amorphous patches and areas of yellow

brown staining. Fine granules of indeterminate material are abundant. Accessory rutile is abundant enough to be separated for examination as a possible indicator mineral.

No phlogopite remains in the rock but some of the muscovite was probably derived from the alteration of phlogopite in place.

Most of the groundmass has been replaced by quartz but some indeterminate material of low birefringence may be relict feldspar. Even this material has probably been partially replaced by clay minerals.

Accessory rutile appears to be unaltered and consists of fine to very fine grained euhedral to subhedral prisms.

Comment

The rock is identified as an altered lamproite as it forms part of a large outcrop of identifiable lamproite. It has clearly undergone hydrothermal alteration and silicification before weathering. Little of the original lithology remains but the amount of accessory rutile is adequate for the purposes for which the specimen was collected.

Specimen 6729 RS 3806 (A), TS C 58966

Rock name — Lamproite with 2 cm inclusion.

Locality — No 15, adjacent to DDH Frankton I, Truro-Frankton province.

Hand specimen

A medium grained, brown, micaceous rock with little weathering contains a grey, fine grained inclusion surrounded by a narrow transitional zone. The texture of the rock is nodular and porous, that of the inclusion is massive.

Thin section

The host rock is a lamproite of Frankton I type, with a biotitic phlogopite but without apatite macrocrysts. The groundmass is relatively coarse grained, consists mainly of potash feldspar and contains abundant quartz. Accessories are predominantly opaque but include a few crystals of rutile.

The inclusion is distinguished by the absence of macrocrysts, an overall finer grain size and the abundance of fine grained biotite. Quartz is particularly abundant and the presence of a few unusually coarse grained and well-rounded zircons suggest that some of the constituents of the inclusion are of xenocrystal origin.

Phlogopite macrocrysts are up to 1 mm across but are mainly finer grained. They are weakly zoned, tend to be of poor shape and crystallinity and show a slight tendency towards preferential orientation.

Groundmass feldspar is either untwinned or exhibits a weak cross-hatched twinning. It is often lath shaped, up to 1.5 mm long and frequently forms slightly radiating aggregates. Quartz is interstitial but appears to be primary rather than of

replacement origin. Groundmass mica is corroded and poorly crystalline.

Opaque material varies from anhedral and skeletal patches to subhedral to anhedral grains. Rare rutile is anhedral and is generally associated with opaque grains.

In the inclusion the mica is a pale biotite close to an average of about 0.05 mm in grain size. The groundmass is composed of the same minerals as in the host rock but with a grain size of about 0.3 mm. Quartz is somewhat more abundant than feldspar. Opaque accessory minerals are anhedral and less abundant then in the host rock. The few zircon crystals present are unusually coarse grained and the high degree of rounding suggests chemical corrosion. This may indicate that the zircon had been incorporated from wall rock and that the inclusion may be an early chilled marginal phase which has been detached and partly resorbed into the main lamproite magma.

Comment

The main interest of this specimen is in the nature and origan of the inclusion. On petrographic evidence the inclusion is essentially authigenic, derived possibly from an early chilled margin of the intrusion, but may have incorporated quartz and a few zircon grains from the wall of a conduit or magma chamber.

Specimen 6729 RS 3806 (B), TS C 58967

Rock name Lamproite with inclusion

Locality No 15, adjacent to DDH Frankton I, Truro-Frankton province.

Hand specimen

The specimen is part of the same boulder as 6729 RS 380 (A). The nodular but porous texture is prominent. The inclusion is a sheet of lighter coloured rock about 5.0 mm thick.

Thin section

Viewed through a hand lens the nodular texture of the rock is apparent in thin section. It is distinguishable at 16 x magnification but with less certainty. At higher magnifications it is scarcely detectable. It is not reflected in regular radial or tangential orientation of minerals although these textures are visible in some places. Porosity is evident at any magnification. The host rock is similar to but more micaceous than specimen RS 3806 (A).

The inclusion is similar to that of RS 3806 (A) despite the difference in shape. It consists of fine grained biotite, feldspar and quartz. It also contains macrocrystalline quartz in grains up to more than 1 mm across. Accessory zircon is not present. Boundaries of the inclusion are sharply distinct.

Comment

The inclusion in this specimen is possible a flake of chilled material incorporated in the main mass

of lamproite. The mass may possibly be an ignimbrite on which a chilled surface formed and was broken up before incorporation. The nodular texture may be the product of small particles rolling across a surface from which mica flakes were picked up. Devitrification may have been assisted by the passage of silica - bearing fluids maintained at a high temperature.

Specimen 6729 RS 3806 (C), TSC 58968

Rock name — Lamproite with inclusion

Locality — No 15, adjacent to DDH Frankton I, Truro - Frankton province.

Hand specimen

Two small spheroidal inclusions, 5 mm across, are contained in host rock from the same boulder as specimens RS 3806 (A) and (B).

Thin section

The host rock is identical to that in RS 3806 (B). The inclusions are quite different.

The inclusions are not sharply demarcated relative to the host rock and are marked simply by an increased abundance of coarse grained phlogopite. There is no other distinguishing characteristic. In one inclusion the phlogopite is oriented parallel to the preferred direction in the host rock and the inclusion is simply a localised high concentration of mica. In the other inclusion the long axes of the mica flakes remain parallel to the orientation of mica in the host rock but the flakes have been turned 90° on that axis. In thin section they are seen broadside on while mica in the host rock is seen in cross section.

Comment

The inclusions in this specimen appear to be the products of magmatic crystallisation in which local aggregations of macrocrysts have been formed, possibly by vortices in magma already carrying mica flakes.

DISCUSSION

Of the two specimens collected as sources of possible indicator minerals, the lamproite 6729 RS 3808 from Schneider's Gossan is only likely to provide apatite and that from the western edge of Truro Township, 6729 RS 3804, would be a source of a little rutile. Both rocks are too weathered to be ideal sources of indicator minerals. However, out of several kilograms of rock enough material may be concentrated for microprobe analysis.

Inclusions in three specimens from Site 15, adjacent to DDH Frankton I, are of two types. Both types are endogenous but while the concentrations of macrocrystal mica in 6729 RS 3806 (C) probably originated as primary local aggregations in the magma, the fine grained micaceous inclusions in RS 3806 (A) and (B) were probably chilled facies produced early in the intrusive stage. These were fractured and detached in later, possibly eruptive, stages and incorporated

as lithic fragments in magma or tuff. Minor components may have originated in the walls of the magma conduit.