

Solid solution between potassic-obertiite and potassic-fluoro-magnesio-arfvedsonite in a silica-rich lamproite from northeastern Mozambique

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Abstract: A fine-grained dike rock was collected during regional geologic mapping in the Xixano region, northeastern Mozambique. Observation in thin section and SEM and EMP analyses showed a fine-grained igneous texture dominated by optically unusual zoned amphibole and Fe³⁺-bearing low sanidine, with Sr-bearing fluor-apatite, rutile, Sr-bearing barite, a silica mineral, hematite and zircon. The mineralogy and major element data indicate an unusual high-silica lamproite. The amphibole is concentrically zoned and pleochroic from pale brown to pale greenish blue, with common abnormal blue and brown interference colours, indicative of high dispersion commonly associated with Fe³⁺. Results of 29 EMP analyses, including two traverses across zoning, were formulated in different modes. The most satisfactory formulae were obtained assuming high Fe³⁺/(Fe²⁺ + Fe³⁺) ratios and significant oxo component (O²⁻ at the O(3) site substituting for (OH, F)). The most Ti-rich core composition approximates: K Na₂ (Mg₃Fe²⁺_{0.5}Fe³⁺₁Ti_{0.5}) Si₈ O₂₂ (F₁O₁), and can be classified as 1:1 solid solution between potassic-obertiite and potassic-fluoro-magnesio-arfvedsonite. Zoning toward the rims increases the potassic-fluoro-magnesio-arfvedsonite component up to K Na₂ (Mg_{3.5}Fe³⁺_{1.5}) Si₈ O₂₂ (F₁(OH)_{0.5}O_{0.5}).

Key-words: potassic obertiite, potassic-fluoro-magnesio-arfvedsonite, brown to blue zoned amphibole, high-silica lamproite, Mozambique.

1. Introduction

During regional geologic mapping of Neoproterozoic metamorphosed sedimentary and igneous rocks in northeastern Mozambique (Bingen *et al.*, 2006), a sample was collected from one of two small outcrops of fine-grained probable dike rock about 25 km southwest from Monte Metocha. The present paper concerns the very unusual amphibole compositions found in this specimen. Another paper covering the complete mineralogy and an Early Ordovician U–Pb zircon age is in preparation.

2. Specimen description

In hand specimen, sample ASO4-36 looks like any other grey fine- to medium-grained dike rock without visible phenocrysts. An initial impression in thin section is of an ophitic textured fine-grained igneous rock with interlocking zoned feldspar and mafic minerals. Only further examination showed the rock is unusual.

The light-coloured minerals are dominated by zoned optically distinctive low sanidine, along with an unidentified SiO₂ mineral, and Sr-bearing barite, discovered only with electron backscatter images. SEM and later EMP analyses of the sanidine (Robinson *et al.*, in prep.) show that the optical zoning from cores to rims is produced by variation from moderate to large amounts Fe³⁺ substitution for Al, up to 25 % K Fe³⁺Si₃O₈. This is coupled with negligible Na content, and trace Ba in cores that grade to nearly Ba-free rims. Such feldspars are reported only from lamproites (Kuehner & Joswiak, 1996).

Other minerals found in this sample and confirmed as common to lamproites (Mitchell & Bergman, 1991; R. Mitchell, pers. comm. 2006) include the K–Na amphibole, which is the subject of this paper, the Sr-bearing barite, Sr-fluorapatite, and rutile, here an unusual golden yellow variety (Robinson *et al.*, in prep.). The sample also has features not previously reported in lamproites. For example, there seems to be no trace of biotite or phlogopite that are common in most lamproites. It also contains small amounts of a silica mineral (so far unidentified) not found in lamproites, except in hydrothermal vugs, though it has