ON THE SCHISTOSE STRUCTURE OF SOME LUJAVRITES

JOHN FERGUSON

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Lujavrites are medium- to fine-grained agpaitic nepheline syenites usually characterised by a trachytoid structure produced by the planarism of the elongate minerals. Paralleling this planar texture some lujavrites display a marked schistosity (Ussing, 1912; Brouwer, 1912). The schistosity of the lujavrites of the Ilímaussaq Intrusion led early travellers to describe them as "chlorite schist" or a "kind of a gneiss" (Giesecke, 1910) and early reference made to the "gneisses" of the Pilanesberg Intrusion (Mauch, 1874) is probably a similar misidentification. Later workers have also been puzzled by the structure of the lujavrites, describing them variously as a metasomatic product (Wegmann, 1938), a combination of metasomatic and magmatic processes (Sørensen, 1958) and a magmatic product (Ussing, 1912; Sørensen, 1958; Ferguson, 1964; Hamilton, 1964).

Ussing saw a relationship between magmatic movements and the structure of the lujavrites in the Ilímaussaq Intrusion; Brouwer in describing the Pilanesberg Intrusion made a similar observation. With the exception of Wegmann all workers since Ussing share the view that the lujavrites of the Ilímaussaq Intrusion represent a rest magma, rich in volatiles, injected during the slumping and faulting that accompanied the closing stages of the evolution of the Intrusion. The marked contrast provided by the general abscence of a schistose structure in the surrounding comagmatic agpaitic rocks of the Ilímaussaq Intrusion points to penecontemporaneous deformation of the lujavrites during intrusion. Other structural features include extensive brecciation, autointrusion, boudinage, fracturing and bending of crystals together with the development of post-deformation poikilitic arfvedsonite anhedra. Similarly, there is reason to believe that the lujavrites are a product of crystal cumulation; this evidence includes rhytmic layering, density, stratification, and the lineation of elongate minerals (Ferguson, in press). Both the deformation and crystal cumulate textures can be observed throughout the exposed thickness of the lujavrites variously estimated at 350 m (Ferguson, 1964), or in excess of 600 m thick (Ussing, 1912).

To explain the crystal cumulate textures and schistose structure of the lujavrites it is necessary to presuppose an initial "magma" largely of unconsolidated mush. Evidence of an expelled volatile-rich intercumulus phase from the lujavritic crystal mush at Ilímaussaq is provided by the abundant presence of natrolite-analcime veins in roof rocks of the lujavrites (Sørensen,

1958; Ferguson, 1964). To account for the schistosity of the lujavrites of Ilímaussaq one would require a residual crystal mush at least 350 m thick, a figure greatly in excess of usual estimates of unconsolidated crystal accumulations.

Recent experimental melting relations on undersaturated alkaline rocks (Piotrowski & Edgar, 1969; Sood & Edgar, in press) demonstrate that the agpaitic nepheline syenites have considerably extended melting intervals and the lowest solidus temperatures when compared to miaskitic nepheline syenites. The difference between liquidus and solidus temperatures for the green lujavrite from Ilímaussaq measured 500° C at 1 atmosphere and 450° C at PH_2O = 1Kb, the solidus temperature at the latter pressure was 430° C.

The considerably extended melting intervals of the agpaitic rocks explains the great thickness of lujavritic crystal mush necessary for the development of the schistose fabric displayed by some of these rocks.

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Dansk sammendrag

Lujavriter (agpaitiske nefelinsyeniter) har ofte en trachytoid textur og dertil i nogle tilfælde en »skifrighed«. Denne må for en stor del skyldes magmatisk differentiation. Ved Ilímaussaq tyder strukturerne på, at lujavriten forudsætter tilstedeværelsen af en 350 m mægtig »krystalgrød«. Eksperimentelle undersøgelser af undermættede alkaline bjergarters smeltepunkter kan forklare fremkomsten af de forudsatte mægtigheder af den lujavritiske »krystalgrød«.

Department of Geology, University of the Witwatersrand, Milner Park, Johannesburg

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