N.P.C., R.G., L.N., C.L.L., D.O., J.R.-H., H.S.,
Institut for Petrologi.
University of Copenhagen,
Øster Voldgade 10,
1350 Copenhagen K.

H.M., P.M., B.H.N.,
Ferskvandsbiologisk Laboratorium,
Helsingørgade 49–51,
3400 Hillerød,
Denmark.

J.F.,
Botanisk Museum,
Gothersgade 130,
1123 Copenhagen K.

S.K.-M.,
Mineralogisk Institut,
Danmarks Tekniske Højskole,
2800 Lyngby,
Denmark.

C.O.N., M.M.H.,
Institut for Almen Zoologi,
Universitetsparken 15,
2100 Copenhagen Ø.

Field work on the kakortokites and lujavrites in the Ilímaussaq intrusion, South Greenland

Steen Andersen and Henning Bohse

In the field season 1977 the study of the kakortokites and the lujavrites was continued in the southern part of the Ilímaussaq intrusion. The mapping was extended to the Agpat area (fig. 25) and a number of sample profiles were collected. S. A., assisted by Peder M. Sørensen and Emanuel Kristiansen, worked to the north-west of the river Lakseelv; H. B. and Ingrid Salinas to the south-east of the river.

Mapping on the scale 1:5000 of the kakortokites and the larger part of the main lujavrite outcrop is now completed. Five units have been distinguished (fig. 26). The lower part of the profile – kakortokite to aegirine lujavrite II – has been measured to the south-east of Lakseelv, whereas the higher units are found in the Agpat region. The two subareas are divided by the Lakseelv fault. A similar sequence, but with a different thickness, exists at the head of Kangerdluarssuk (A. Demina, personal communication).

In contrast with the standard map and profile as given by Ferguson (1964), we have divided the aegirine lujavrites into three units: aegirine lujavrites I and II and schlieren lujavrite. Later Ferguson (1970, pp. 30–31) also hesitated to class what is our schlieren lujavrite into the aegirine lujavrites proper.

Aegirine lujavrites I and II are conformable units with a gradual transition and they are merely divisions of the main lujavrite profile. The division can, however, be mapped all over the region, and preliminary chemical analyses confirm the difference between the two rock units. Aegirine lujavrite I forms the lower unit with a thickness of about 80 m. The rock is distinctly laminated and displays a strong fissility. Banding is expressed by variations in the proportions of nepheline and microcline. The rock is fine-grained with grain size decreasing upwards. Aegirine lujavrite II forms two layers (approximately 85 and 35 m thick) above

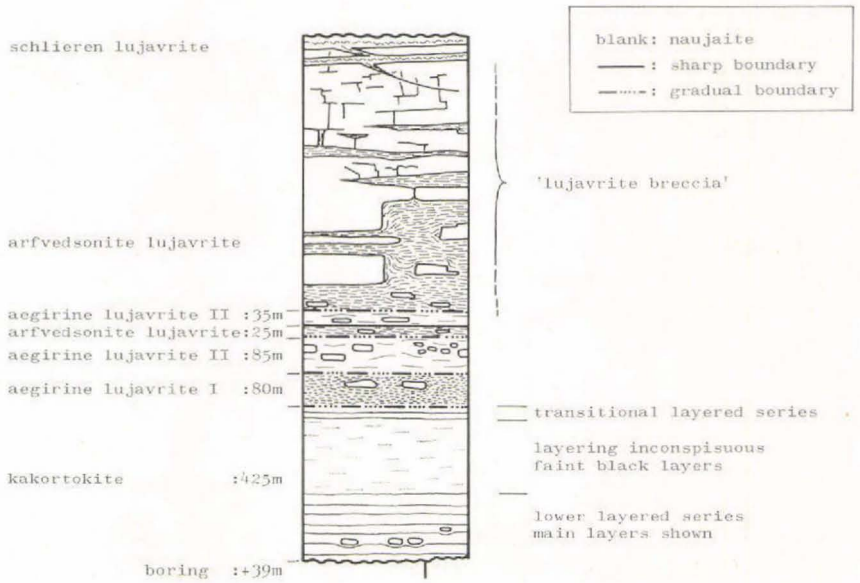

Fig. 26. Generalised profile through the kakortokite and lujavrites in the Agpat area, east of Lakseelv, Ilímaussaq alkaline intrusion, South Greenland.

aegirine lujavrite I which are separated by a layer of arfvedsonite lujavrite. The contact between the arfvedsonite lujavrite and the upper layer of aegirine lujavrite II is sharp, all other boundaries in the profile are gradual. Aegirine lujavrite II is well-laminated and has a strong fissility, but differs from aegirine lujavrite I since banding is indistinct or lacking. Moreover aegirine lujavrite II is usually finer grained and has a lighter green colour.

The schlieren lujavrite makes up the lujavrite outcrops in the northern part of the area on the slopes towards Tunugdliarfik fjord. This unit is independent of the main lujavrite profile and is only found at a high level in the naujaite. It is intrusive and younger than the arfvedsonite lujavrite and as such the youngest rock unit in the area. The mineral composition of this unit is similar to the aegirine lujavrites – feldspar, aegirine, nepheline and eudialyte – but the structure is entirely different: lamination and fissility are lacking and the minerals show an irregular, pegmatite-like intergrowth. The rock in general is medium-grained with the schlieren expressed by slightly coarser or finer grain size. Furthermore, the rock is rich in coarse pegmatitic veins and patches dominated by decimetre-sized crystals of microcline and arfvedsonite in a matrix of natrolite. Steenstrupine is a common accessory of the pegmatites. This rock in some ways resembles the medium- to coarse-grained lujavrite in the uranium-ore of Kvanefjeld.

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Institut for Petrologi,
University of Copenhagen,
Øster Voldgade 10,
1350 København K.

Preliminary geochemical work on the Ilímaussaq alkaline intrusion, South Greenland

John Bailey, Raymond Gwozdz, John Rose-Hansen and Henning Sørensen

As part of the geological investigation of the Ilímaussaq intrusion (Sørensen, 1970; Ferguson, 1964; Andersen, *et al.,* 1973; Sørensen *et al.,* 1974), trace-element analyses have been performed on carefully chosen rock samples. Material was selected on the basis of detailed field mapping and with particular attention paid to its fresh and representative nature; in every case more than 15 kg was obtained by blasting. The samples have already been used for the separation of accessory ore minerals and for analysis of fluid inclusions.

To date, the rocks have been analysed for trace elements by neutron activation (R.G.) and X-ray fluorescence (J.B.) analysis. Comparisons with earlier analytical results indicate closest agreement with the work of Gerasimovsky (1969), except for the element Ga where his results are consistently higher. Experiments by Ib Sørensen (GGU Chemical Laboratory) indicate that fused samples yield low totals for many Ilímaussaq rocks; the absorption effects of heavy minor elements (Zr, Nb, REE) on the light major elements will be quantitatively corrected for. Analyses by isotope fluorescence, delayed neutron analysis, X-ray spectrometry and other techniques are in progress.

Average trace-element analyses are presented for seven agpaitic rocks types from the Ilímaussaq intrusion in Table 3; sample localities are indicated in figure 25.

The alkali elements (Rb, Cs) typically occur at high levels and the rocks exhibit low K/Rb and K/Cs ratios. These tendencies become more pronounced in the final lujavrite differentiates.

Sr and Eu^{2+} are considered to be largely removed in the early stages of fractionation by feldspars. In the agpaitic rocks, they mainly enter eudialyte.

Rare-earth elements (REE, La-Lu, Y) reach exceptionally high levels in the eudialyte-rich kakortokites, and in the final lujavrites where a number of REE minerals are developed. In earlier agpaites (sodalite-bearing foyaite and naujaite, kakortokites), REE contents correlate with Zr and the REE are mainly located in eudialyte. Whole-rock REE spectra (fig. 27) reveal (a) a general increase in total REE, (b) increase in light REE/heavy REE in the lujavrites and (c) a more or less uniformly negative Eu anomaly.