Hughes, 1977). In sapphirine sites which can become available for occupation by Cr^{3+} may be created by an Al^{3+} to Cr^{3+} substitution during the formation of the sapphirine.

This detailed mineralogical work on reaction rocks produced at the contact of the anorthosite complex provides corroborative evidence for conditions of high water vapour pressure during the crystallisation history of the Fiskenæsset anorthosite complex.

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Thorium-uranium mineralisation in the vicinity of the Igdlerfigssalik centre of the Igaliko Complex, South Greenland

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The existence of radioactive rocks in the area south of the Igdlerfigssalik centre of the Igaliko nepheline syenite complex has been known since 1962 (S. Andersen, personal communication). Reconnaissance radiometric investigations on the ground and from a helicopter in 1979 and 1980 revealed a large number of occurrences of radioactive mineralisation. The characteristics of the mineralisation are briefly described.

Geology

The area is underlain by the Proterozoic 'Julianehåb Granite' (1810–1770 m.y.; van Breemen *et al.,* 1974) which during the Gardar period (1330–1150 m.y.; Emeleus & Upton, 1976) was faulted and intruded by numerous ENE-trending dykes, and the emplacement of

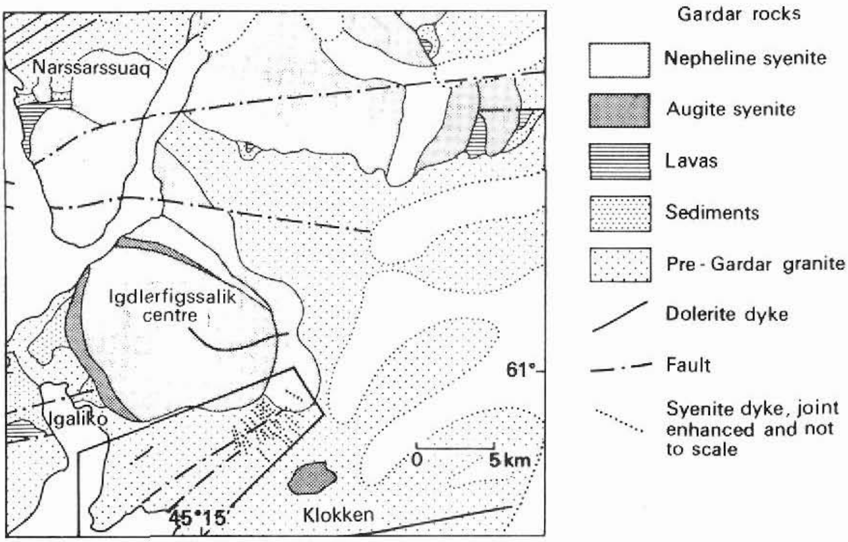

Fig. 15. Simplified geological map of the Igaliko area, South Greenland (from Emeleus & Upton, 1976). Structures containing Th-U mineralisation are shown in the outlined area.

the four central alkali syenite centres of the Igaliko complex. The Igdlerfigssalik centre is the youngest of the intrusive centres. Emeleus & Harry (1970) established the following chronology for the major events in the area: (1) early Igdlerfigssalik syenite units, (2) mid-Gardar ENE-trending dykes, (3) early faults trending N–S and NE–SW, (4) late Igdlerfigssalik syenite units (1167±11 m.y.; Blaxland *et al.*, 1978), (5) minor NE–SW faulting, and (6) late Gardar dykes. A few subhorizontal sheets of alkali syenite bounded by the major ENE fractures (fig. 15), and also a number of 150°–180° striking dykes of pegmatitic to coarse-grained alkali syenite intersect the basement granite. The syenitic dykes and joints cut the mid-Gardar 60°-trending dykes but they are in turn dissected and disturbed by later 60° movements. Their exact relation to the late Igdlerfigssalik syenite units is uncertain.

Mineralisation

Occurrences of Th-U mineralisation are controlled by two sets of fractures, one striking east-north-east, approximately 60°, i.e. parallel to the main dyke and fault direction, and another less prominent set of 150°–180° fractures. The two most marked 60° fracture zones are shown on the map in fig. 15.

The 60°-trending fractures are vertical or steeply dipping north-west. The degree of cataclasis varies from weak shearing and brecciation to strong mylonitisation. Fluorite and vein quartz, less commonly chlorite, amphiboles and carbonate veinlets occur in the matrix of the breccias. The fracture zones generally display slightly elevated radioactivity. High radioactivity occurs in small spots, or in zones several tens of metres long, and is mostly confined to highly brecciated or mylonitised rocks which are characterised by strong haematisation.

Table 5. Gamma-radiation and uranium content of samples from the vicinity of the Igaliko Complex

Host to mineralisation	Background μR/h	Peak values μR/h	Analysed samples range of U ppm
Fault breccia, mylonite	20	500-1000	26-40
Quartz aegirine joint fillings	20-40	200-1000	32-42
Fenitised granite	15	500-1500	13-165
Fractured syenite dykes	10	500-1500	5-49

Quartz-aegirine joint fillings, 0.5 to 5 cm wide, are quite common in the granite, and they usually display irregularly distributed elevated radioactivity. The radioactive joints have an east-north-east and less commonly a north–south strike.

The Th-U occurrences in the 150°–180° striking fractures are confined to the alkali syenite dykes and joints filled with alkali minerals. A few syenite dykes and joints close to the 60°-direction were also observed. The radioactivity is found in, or adjacent to, coarse-grained pegmatitic syenite dykes up to several metres wide, in medium-grained syenite dykes, often less than 0.5 m wide and in thin joints filled with dark micaceous minerals and aegirine.

The dykes are rich in feldspar and contain arfvedsonite and/or aegirine, sometimes minor eudialyte and sporadic quartz. They are often sheared and altered having a dark rusty brown colour.

The granite adjacent to the alkali syenite dykes is often impregnated by fluorite and displays Na-metasomatism (formation of albite and Na-pyroxene). Spots of high radioactivity are associated with the metasomatised granite.

The field measurements of the gamma radiation and the analyses of samples from the investigated area are summarised in Table 5. Semiquantitative gamma-spectrometer measurements of rock samples have shown that Th commonly dominates over U.

Origin of mineralisation

The mineralogy and orientation of the mineralised dykes indicate that they are related to the alkaline magmatic activity in the Igdlerfigssalik centre. They cut the ENE-trending mid-Gardar dykes and are consequently thought to be associated with the intrusion of late syenite units. The mineralisation in the dykes is associated with fractures and alteration, and must be epigenetic. The frequency of radioactive occurrences decreases away from the Igdlerfigssalik centre, and it therefore seems probable that the mineralising fluids transporting Th and U were derived during late to post-magmatic processes. The association of radioactivity with fluorite and Na-rich minerals suggests that these fluids were rich in Na and F, which again would point towards an origin related to alkaline magmatism.

Radioactive mineralisation in ENE-trending structures is widespread throughout the entire Gardar province (Ivigtut area; Berthelsen & Henriksen, 1975 and Narssaq peninsula;

Hansen, 1968), and a possibility still exists that the mineralisation in the ENE-trending structures in the vicinity of the Igdlerfigssalik centre belongs to a more extensive Gardar mineralising event.

Conclusions

The occurrences of Th-U radioactive mineralisation which, wholly or in part, can be related to the neighbouring Igdlerfigssalik centre, are small and scattered; only those in the ENE-directed structures have dimensions of some interest. The available analyses indicate that the radioactivity is mostly due to thorium and the possibility of finding economic uranium-occurrences in this area is regarded as unlikely.

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Uranium-bearing metasediment and granite in the Tasermiut area, South Greenland

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Regional exploration for uranium was carried out in South Greenland in 1979 and 1980. From the planning stage the area between the fjords Tasermiut and Søndre Sermilik (fig. 16) was considered a favourable target because uranium deposits from geological environments of similar age, structure and lithology are known, e.g. the Makkovik Bay area in Labrador (Gandhi *et al.,* 1969; McMillan, 1976). The deposits sought were mainly pegmatitic or vein type deposits related to a Proterozoic unconformity (Nielsen, 1980). During the South