

ON THE AGE OF THE ILÍMAUSSAQ AND IGALIKO INTRUSIONS IN THE GARDAR PROVINCE OF SOUTHERN GREENLAND

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A sample of well crystallised zircon from a pegmatite at Nars-sárssuk near Igaliko, South Greenland, has been dated by uranium-lead methods. Although the sample has suffered loss of uranium a probable age of 1150 ± 120 m.y. has been calculated. Lead from a galena sample from a hydrothermal vein at Kvanefjeld near Narssaq is shown to be anomalous due to the polycyclic nature of the rocks of South Greenland.

During a visit to South Greenland in 1964 the firstnamed author collected a specimen of well crystallised, euhedral zircon from a pegmatite at Nars-sárssuk near the village of Igaliko, South Greenland. The pegmatite is genetically related to the Igaliko nepheline syenite intrusion of which no age determination has yet been published. An attempt has now been made to determine the age of the zircon by uranium-lead methods.

The investigation also includes the measurement of the isotopic composition of lead in a sample of galena from a hydrothermal vein at Kvanefjeld near Narssaq. The vein is related to the Ilímaussaq nepheline syenite intrusion. The most reliable age determinations, made by Rb/Sr mineral dating on polyolithionite from Ilímaussaq (Moorbath *et al.*, 1960 and Bridgwater, 1965), give ages between 1012 m.y. and 1030 m.y. while a K/Ar age determination on the same material has given a dubious age of 1180 m.y.

The Igaliko and Ilímaussaq intrusions both belong to the Gardar period of cratogenic igneous activity. The two intrusions are situated approximately 30 km apart in an elongated downfaulted basin of Gardar supra-crustal rocks.

The isotopic composition of lead was measured by mass-spectrometry; the lead content in zircon was determined using the method of isotope dilution. Total uranium and thorium was measured by radiochemical methods.

	Content %			Isotopic composition of Pb			
	U	Th	Pb	204	206	207	208
Zircon	0.039	0.15	0.0210	0.274	44.98	7.32	47.43
Narssárssuk							
Galena				1.41	24.03	22.56	52.00
Kvanefjeld				1.00	16.98	15.94	36.75

The contents of ^{206}Pb and ^{207}Pb in the galena sample show that this lead is somewhat anomalous. The model age of the galena is equal to 1600 m.y. which is the age of the surrounding pre-Gardar granites and gneisses. Considering the polycyclic nature of the rocks of South Greenland, however, the isotopic composition of lead in the galena sample does not contradict an age of 1000–1200 m.y. for the hydrothermal stages of the Ilímaussaig igneous activity.

The measurements on the zircon show that the mineral has suffered a loss of uranium resulting in a spreading of the age results calculated using different isotopic ratios. In such cases the lead-lead ratio changes the least and the best age is therefore calculated by this ratio. With only one sample and not knowing the composition of admixed lead, it is not possible to produce an exact age for the formation of the zircon. Using the isotopic composition of the lead from the galena sample as the composition of admixed lead an age value of 1030 ± 110 m.y. is estimated from the $^{207}\text{Pb}/^{206}\text{Pb}$ -ratio. If instead the isotopic composition of the lead ores of the Fron-te-nac district, Quebec, is introduced (age: 1000 m.y., $^{204}\text{Pb} : 1.00$; $^{206}\text{Pb} : 16.53$; $^{207}\text{Pb} : 15.28$; $^{208}\text{Pb} : 35.55$; see Tilton *et al.*, 1955) an age of 1150 ± 120 m.y. is calculated. This latter age is in good agreement with ages of $1140\text{--}1150 \pm 90$ m.y. calculated using the $^{208}\text{Pb}/^{232}\text{Th}$ ratio. The value of 1150 m.y. is therefore believed to be the most probable age for the zircon-bearing pegmatites of the Igaliko intrusion. This figure also agrees with the geological evidence (Emeleus & Harry, *in press*).

Complete lists of recent isotopic age determinations on minerals and rocks from the Precambrian of West Greenland have been published by Larsen (1966), Larsen & Møller (1968), and Jørgensen (1968).

Note

In the age estimations the following constants have been used:

Half-life of ^{235}U : 7.13×10^8 years
 Half-life of ^{238}U : 4.51×10^9 years
 Half-life of ^{232}Th : 1.39×10^{10} years
 Isotopic ratio $^{238}\text{U}/^{235}\text{U}$: 137.7 ± 0.5

Dansk sammendrag

Zirkon fra en pegmatit ved Narssárssuk nær Igaliko, Sydgrønland, er dateret på basis af uran-bly metoder. Trods et tab af uran er en sandsynlig alder på 1150 ± 120 millioner år beregnet. Bly fra blyglans taget i en hydrotermal åre ved Kvanefjeld nær Narssaq vises at være anormal på grund af bjergarternes polycykliske natur i Sydgrønland.

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