AND O ISOTOPIC STUDY OF THE CARBONATITE-SYENITE ASSOCIATION IN THE GRØNNEDAL-IKA COMPLEX, GARDAR PROVINCE, SOUTH GREENLAND

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The Grønnedal-Ika alkaline complex in the Gardar Province, South Greenland, comprises layered nepheline syenites which were intruded by a xenolithic syenite and a plug of carbonatite. The complex, dated at 1299 ± 17 Ma by a Rb-Sr whole-rock isochron (Blaxland et al. 1978), was emplaced into early Proterozoic gneisses and metasediments. Pearce et al. (1997) concluded on the basis of C and O whole-rock isotope data that the carbonatites and syenites were not genetically related. New O and Nd isotope data of mineral separates from the syenites and of whole-rock carbonatites are presented below. These are consistent with a common mantle source and may indicate that the carbonatites could have been generated by liquid immiscibility from a CO₂-rich nepheline syenite magma. Aegirine-augitic clinopyroxene is the most common mafic mineral in the syenites. Oxygen isotope measurements of clinopyroxene separates show homogeneous δ¹⁸O values from 4.2 to 4.8 per mil. δ¹⁸O values for the coexisting melts were calculated using fractionation factors by Kalamarides (1986) and a temperature estimate for the syenites of 700 degree C derived from phase equilibria between clinopyroxene, alkali feldspar and nepheline. The resulting δ¹⁸O_melt values range between 5.1 and 5.7 per mil. These values are within the lower range of typical mantle-derived magmas. Published oxygen isotope analyses of the carbonatites are also compatible with a mantle origin for the carbonatites (Pearce et al. 1997). Initial ε_{Nd} values at T = 1.30 Ga of selected clinopyroxene separates yield values between +1.8 and +2.8 for the syenites and -1.7 for a gabbroic xenolith. Whole-rock Nd analyses of carbonatites gave initial ε_{Nd} values of +2.4 to +2.8. Hence, there appears to be no significant difference in Nd isotope composition between syenites and...
carbonatites and both indicate an isotopically slightly depleted mantle source region. The initial $\epsilon_{Nd}$ of the gabbroic xenolith is compatible with minor amounts of crustal contamination.