addition, spindles and irregular forms of coarse-grained massive chromite may be found set in fine-grained chromite. In the nodular type, the nodules may be spherical to oval, and vary in diameter from 3 mm to 2 cm. At one outcrop, nodules occur in clusters. Nodular and chromite-net (Thayer, 1969) textures may occur side by side in the same ore body.

Chemical analyses of seven samples of purified chromite presented in Table I show that they contain 39·06 % to 50·66 % Cr_2O_3 and their Cr/Fe varies from 2·06 to 2·53. This, together with the reciprocal relationship between Cr_2O_3 and Al_2O_3 (fig. 2), non-relationship between Cr_2O_3 and total iron and a below-16 total iron content (Thayer, 1970) shows that these chromites are chemically comparable to most other refractory grade podiform chromites of the world, such as those described by Thayer (1969, 1970), Zachos (1964), Hutchison (1972), and Jackson and Thayer (1972). Plots of the seven analyses (fig. 3) on the triangular diagram of Stevens (1944) show that six belong to the 'aluminian chromite' field and one to the 'chromian spinel' composition range. None could fall in the metallurgical grade. These chromites are more aluminous than the chromites of the alpine type Zhob Valley igneous complex of Pakistan, most of which are of high-chromium type and metallurgical grade (Ahmad, 1972; Bilgrami, 1963; Bilgrami and Ingamells, 1960). Reflectivity, micro-hardness, and unit cell edge determinations are also reported in Table I.

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The parental basaltic magma of granites from the Isle of Skye, NW. Scotland

THE origin of the granitic rocks of the Isle of Skye might be accounted for by fractional crystallization of basaltic magma, or alternatively by melting of older sialic crust (Gass and Thorpe, 1976). We have recently argued, using rare-earth element (REE) evidence, that a fractional crystallization origin for the granites is much more likely than an origin by melting of the underlying Lewisian gneiss or Torridonian sandstone, which form the sialic basement of Skye (Thorpe *et al.*, 1977). Mattey *et al.* (1977) have reported REE data for basaltic rocks from Skye that throw more light on the origin of the Skye granites. The purpose of this note is to show that the REE data of Mattey *et al.* (1977) provide further support for a fractional crystallization origin for the Skye granites.

Mattey *et al.* (1977, p. 273) show that 'the basalts of the Skye lava pile and dyke swarm may be divided into three *magma types*, each of which related to others by low-pressure crystal-liquid shows internal chemical variation but cannot be processes'. These magma types fall into the broad chemical groups olivine tholeiite and alkali basalt and the three groups are: the 'Preshal Mhor' magma type, a high-calcium, low-alkali group showing depletion in light rare-earths and having $Ce_N/Yb_N < 1{\cdot}0$ (Ce_N = chondrite-normalized Ce concentration); the 'Fairy Bridge' magma type characterized by a flat or light rare-earth-enriched pattern with Ce_N/Yb_N 1·7–2·4; and a group of basaltic rocks and their derivatives that are equivalent to the 'Skye Main Lava Series' (SMLS;

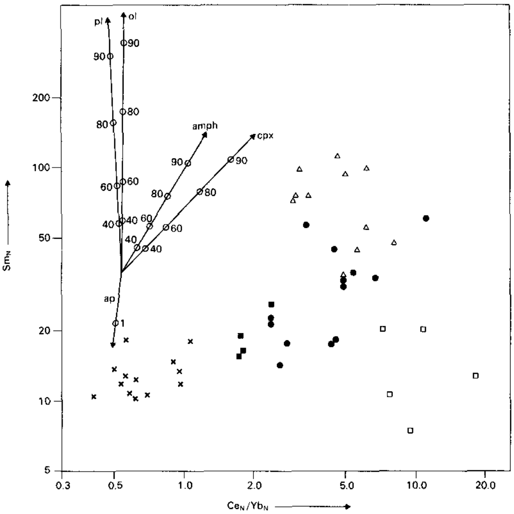

FIG. 1. Plot of chondrite-normalized Sm (Sm_N) against Ce_N/Yb_N for some rocks from Skye. Crosses are Preshal Mhor type basaltic dykes, filled squares are Fairy Bridge type basaltic dykes and filled circles are Skye Main Lava Series dykes, all from Mattey *et al.*, 1977. The open triangles are Skye granites and the open squares are Lewisian and Torridonian rocks from Skye and Rhum, from Thorpe *et al.* (1977). The arrows indicate the change in Sm_N and Ce_N/Yb_N during fractional crystallization of plagioclase (pl), olivine (ol), clinopyroxene (augite; cpx), amphibole (amph), and apatite (ap), calculated by the Rayleigh fractionation law using partition coefficients given in Arth and Hanson (1975). Figures indicate the proportion of melt remaining.

Thompson *et al.*, 1972), and have $Ce_N/Yb_N > 2{\cdot}4$). These three magma types are clearly distinguished on a plot of Sm_N against Ce_N/Yb_N (fig. 1). Also plotted on fig. 1 are Skye granites and Lewisian and Torridonian rocks from Skye and Rhum (Thorpe *et al.*, 1977).

Fig. 1 has vectors that show the change in composition of melts derived by fractional crystallization (or partial melting) of a source material of specified Sm_N and Ce_N/Yb_N. The directions of the vectors indicate that for most of the minerals considered—olivine, clinopyroxene (augite), amphibole, and plagioclase, both fractional crystallization and partial melting produce melts with *higher* REE (Sm_N) and similar or *higher* Ce_N/Yb_N, the latter ratio depending on the amount of clinopyroxene involved. Crystallization of apatite, however, causes depletion of REE without marked change in Ce_N/Yb_N. Since the Lewisian and Torridonian rocks both have higher Ce_N/Yb_N ratios than the granites (fig. 1), they are not suitable parental materials for the granites (see Thorpe *et al.*, 1977 for more detailed discussion). Similarly, members of the Preshal Mhor magma type have much lower Ce_N/Yb_N ratios than the granites and could not yield melts with the REE characteristics of the granites except under extreme and unlikely conditions involving massive clinopyroxene crystallization. In contrast to the possible parental materials discussed above, some members of the Fairy Bridge and SMLS magma types have similar and lower Ce_N/Yb_N and Sm_N values to the granites and the vector relationships between these groups indicate that fractional crystallization of some of these basaltic rocks could yield (granitic) melts with the REE characteristics of the Skye granites.

The REE data reported for the Skye basaltic magma-types (Mattey *et al.*, 1977) therefore places additional restraints on the origin of the Skye granites. Accepting that the granites are unlikely to be produced by melting of Lewisian or Torridonian rocks like those exposed at the surface of Skye (Thorpe *et al.*, 1977), and that the granites are probably not derived from a single source, the parental basaltic magmas may be olivine tholeiites or alkali basalts ('transitional basalts') showing light rare-earth-enrichment (Ce_N/Yb_N 2–5; Sm_N 20–40 but with isotopic evidence of interaction with the continental crust (Thorpe *et al.*, 1977). The difficulty in deriving the Skye granites from the local basement, and the occurrence on Skye of a range of basaltic rocks with appropriate parental characteristics therefore favours an origin for the Skye granites by fractional crystallization processes.

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