from a source region shows that the planet must be on the order of 100 km or more in radius to segregate and deliver a small fraction of melt to the surface before it congeals at depth. This conclusion is dependent on the permeability of the source region which is more sensitive to the crystal size than details of packing geometry. We have chosen values of these parameters (5cm crystals approximating spheres) and the density contrast (0.1-0.3 gm/cm^3) which probably promote segregation to an unrealistically large degree. Therefore the 100 km estimate of planet radius must be considered a minimum for these reasons as well.

Serra de Magé

134 PETROGENESIS OF THE SERRA DE MAGÉ CUMULATE EUCRITE.

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The Serra de Magé meteorite is a medium to coarse grained igneous anorthositic norite cumulate (eucrite) with a mosaic texture. Petrofabric analysis of plagioclase shows a weak preferred orientation (010) indicative of a cumulus process. Modally our section has 64% plag, 34% pyx, 1.8% other; normative plag is ∿58%. Phases present are plag (An_{95}), opx ($En_{55.5}$), augite ($Wo_{45}En_{39}Fs_{16}$), chromite (Cr_2O_3, 50-54%), SiO_2, Ni-Fe (Ni, 0.3-1.5%; Co, 0.8-1.2%), troilite, and a trace of ilmenite; zircon and phosphate are present but were not found in section. Plag twin law study reveals mainly polysynthetic twins with multiple twin laws. Of 142 twins studied in 107 grains there was 39% Pericline, 28% Manebach-Ala=Acline, 18% Albite, 15% Albite-Ala; this suggests an unrecrystallized igneous rock although there may be some subsolidus annealing. A new bulk analysis resolves the wide variation in Al_2O_3 (12-27%) content of earlier work and gives 20.89% which is an appropriate value. The meteorite shows no evidence of shock and is uncontaminated with regard to any other rock component in contrast with lunar anorthositic rocks. It is highly equilibrated and the pyroxenes record a complex subsolidus history (see Harlow et al. abstract). It is the most feldspathic cumulate eucrite, as compared with Moore Co. and Moama, and was derived by late fractionation from a more magnesian melt than those of non-cumulate eucrites (Stolper, 1977). The cumulate eucrites appear to be part of a meteoritic ANT suite whose other members are not well represented in achondritic meteorites. These members may include diogenites, coarse fragments in howardites and in silicate portions of mesosiderites, and are associated with basaltic eucrites.

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135 PYROXENE RELATIONS IN THE SERRA DE MAGÉ METEORITE

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Pyroxenes of the Serra de Magé eucrite exhibit complex exsolution features. These have been studied by single-crystal X-ray diffraction, optical, and microprobe techniques. The host is hypersthene (∿85 vol%), Pbca. Several types of augite, C2/c occur: A1 - thick lamellae (≤25 μm thick) are relict (001) exsolution from pigeonite; A2 - usually fine (<1 μm thick) but sometimes blebby (100) lamellae from hyp; A3 - septa and lenses (∿5 μm thick) on ∿(052) of hyp; and A4 - irregular small (3-7 μm) blebs. A2 aug is ubiquitous; A1 lamellae are common, spaced from 90 to ∿250 μm apart; and A3 and A4 are common but occur in local discrete volumes. A1 and hyp share $\underline{b}^*$, while the $\underline{a}^*$directions are normally separated by 2-3°; it was 17° in one case. A2 appear to be partially coherent with hyp, having common $\underline{b}^*$, $\underline{a}^*$ directions, and $\underline{c}^*_{A2}$ parallel to $[101]^*_{hyp}$. The relations have features of opx of both the "Stillwater" and "Kintoki-San" types (c.f. Ishii and Takeda, 1974). However, the existence of four types of aug in one host grain does not fall into any existing model of pigeonite exsolution, suggesting complexities in its origin. Conclusions. The following thermal history of pyx in Serra de Magé is proposed: 1) Crystallization of pig ($Wo_{6.6}En_{54.0}$; 9 vol% A1) above the pig eutectoid reaction temp, ∿1130°C; 2) Exsolution of A1 lamellae begins at ∿1060°C on cooling below the metastable pig-aug solvus; 3) As (001) lamellae grow, pig changes to clinohyp by removal of Ca; 4) Inversion of clinohyp to hyp ($Wo_{2.7}En_{55.5}$) near the intersection of the metastable aug solvus with the hyp solvus (∿900°C) is nearly ideal (small degree of misorientation) but may incur some recrystallization; 5) Exsolution of A2 aug on (100) occurs on further cooling. Relations of the A3 and A4 aug are unclear but the crystallographic orientation suggests growth from hyp. Comparison of the exsolution textures and initial pig compositions of Serra de Magé with the cumulate eucrites Moama ($Wo_{3.0}En_{56.7}$) and Moore County ($Wo_{10.1}En_{45.6}$) shows that Serra de Magé crystallized with an intermediate cooling rate and at a cumulate depth of ∿10 km in an achondrite parent body (c.f. Miyamoto et al., 1977).

136 SM-ND SYSTEMATICS OF THE SERRA DE MAGÉ EUCRITE.

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As part of a consortium study of the basaltic achondrite Serra de Magé, we are currently attempting to obtain an internal isochron age by the Sm-Nd dating method. Because of the relatively unshocked nature of this eucrite (as compared to Juvinas or Stannern), it is of obvious importance to compare ages obtained by different dating schemes, as well as the interrelation of the Sm-Nd systematics of the various eucrites. At this time, however, it is not clear whether sufficient amounts of different mineral phases can be separated in order to secure a precise internal Sm-Nd isochron, considering the high, but variable, abundance of plagioclase (64-95%) in this meteorite.