PHASE SEPARATION IN PLAGIOCLASE-POIK MESOSIDERITES; Roger H. Hewins and Theresa A. Harriott, Dept. of Geological Sciences, Rutgers University, New Brunswick, New Jersey 08903.

Introduction The classification of mesosiderites is based on the texture of the silicate fraction which reflects the extent of heating after metal-silicate mixing took place (1-3). From textural features, we suggested that the plagioclase-POIK subgroup of (2) contained a silicate melt matrix (3). This paper reports mineral composition data consistent with the presence of a silicate melt fraction and modal variations which suggest that this liquid phase was separating from the denser fraction under the influence of gravity.

Pyroxene Compositions Budulan and Mincy are two similar plagioclase-POIK mesosiderites, the main difference being somewhat more magnesian pyroxene in Budulan (4,5). Orthopyroxene clasts differ (En80-70 in Budulan and En73-67 in Mincy (3,5)) but, in contrast, orthopyroxene chadacrysts are virtually the same for both (En72-68, with rare exceptions in Mincy). Large clasts in Budulan include strongly zoned magnesian (En80-70) and more ferroan unzoned (En70) examples. Reverse zoning (En68-72) has been observed in the most ferroan clast in Mincy. Inverted pigeonite mantling magnesian clasts is more magnesian than chadacrysts but inverted pigeonite interstitial to plagioclase is more ferroan than chadacrysts. These observations for Budulan and Mincy are consistent with various orthopyroxene clasts immersed in an essentially homogeneous melt matrix, with reaction of those clasts not in equilibrium with the melt, and with crystallization of orthopyroxene chadacrysts and subsequent crystallization of interstitial pigeonite.

Modes Mincy AMNH 887-1 is fine-grained, with interstitial-poikilitic plagioclase rather than coarser-grained "flood" poikilitic plagioclase, at one end. This finer-grained region contains only 17-18% plagioclase in the silicate fraction, whereas the coarser-grained matrix which encloses most of the metal in the section contains 27-28% plagioclase. The range in plagioclase contents might be due to an initial heterogeneous distribution of clastic debris, but the variation from 15.6 (6) to 28.3% plagioclase in Mincy matrix is greater than the variation from 18.8 to 24.9% plagioclase in the matrix of the subgroup 1B mesosiderites ALHA 77219, 81059 and 81098. The variation indicates pyroxene clast-rich and plagioclase-rich, i.e. melt-rich, fractions in Mincy, suggesting that the silicate melt was separating from the rest of the rock. The presence of most of the metal in the melt-rich silicate suggests the possibility of limited metal segregation too.

Phase Separation It has been suggested that metal entered the mesosiderites as a liquid (3,6) and some mesosiderites also contained a silicate melt fraction (2,3). A major question (3) is why the two liquid phases failed to separate gravitationally. The conventional answer (2) has been that in clast-laden melt-rocks, cold clasts rapidly reduce the viscosity of silicate melt, but in some mesosiderites about 90% of the mixture was liquid (3). Takahashi's experiments (7) have shown that in a mixture of metal liquid, silicate liquid and olivine crystals the only phase separation observed is of silicate melt flowing to the top. Metal liquid is unable to sink because it becomes attached

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to the olivine crystals (without wetting them). Similar behavior may have occurred when mesosiderites were mixed, with the Mincy silicate melt the only fraction able to migrate.

The textural variations in Mincy are such that the fine plagioclase-poor region might be assigned the Floran classification (2) incipient plagioclase-POIK or 2B. If the above reasoning is correct, this suggests a genetic link between 2B and 3B mesosiderites (all of which are called 4B in (3)). RKPA 80258 is very plagioclase-poor (5% of silicates)and is probably a pyroxene residue (clasts plus minor chadacrysts) from which silicate melt has been extracted. This argument cannot be extended to the other Reckling Peak mesosiderites, which do not contain plagioclase, as very similar pyroxenite material occurs as clasts in other mesosiderites.

Conclusions Plagioclase-POIK mesosiderites contained liquid and solid silicate and liquid metal fractions. Phase separation was retarded by the attachment of metal drops to (hot) silicate clasts and/or by the quenching effect of cold silicate clasts, but modal differences in 2B and 3B mesosiderites can be explained by migration of the silicate melt upwards.

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