

A textural and chemical view of melting of the Sahara 97072 (EH3) meteorite at 5 GPa and different temperatures

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Melting interval of (Fe, Ni)-sulfide and silicate was studied with heating experiments on the Sahara 97072 (EH3) meteorite at 5 GPa and 1000-1700°C using multi-anvil apparatus. Results from our experiments show that: (1) (Fe, Ni)-bearing sulfide is completely molten at 1200°C; (2) partial melting of silicate begins at 1400°C; and (3) the Sahara 97072 meteorite is completely melted at 1600°C. At 5 GPa, both pyroxene and olivine appear to be stable near the liquidus as the first liquidus phase, indicating that 1600°C and 5 GPa is very close to the pyroxene-olivine cotectic.

Overheating the Sahara 97072 meteorite sample to 1650 and 1700°C causes (Fe, Ni)-alloy exsolved from (Fe, Ni)-sulfide, and the spherical shape of the (Fe, Ni)-alloy indicating that the exsolution happened during heating rather than quenching. The coexisting of (Fe, Ni)-alloy and S-rich metallic phase at higher heating temperature could be results of the decrease of partitioning coefficient of S between metallic liquid and silicate liquid with temperature or the volatility loss of S at overheating conditions. The silicate liquid in these two experiments shows smaller Mg[#] than the completely melt condition, indicating a relatively larger Fe content in the silicate liquid, which is consistent with the decreased bulk content of metallic liquid. Results from these experiments suggest that the relatively small planetary bodies with elevated sulfur content would have likely experienced sizable core stratification during early melting event as a result of the segregation of (Fe, Ni)-alloy from (Fe, Ni)-sulfide.

Keywords: enstatite chondrite, partial melting, core formation

