EARLY EVOLUTION OF THE H CHONDRITE PARENT BODY: RECORD IN CHROMITE-PLAGIOCLASE ASSEMBLAGES.

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Introduction: Aggregates composed of chromite and plagioclase (CPA) in ordinary chondrites are interpreted as products of impact-melting [1]. However, they are ~4 times more abundant in H chondrites [2] compared to other types of meteorites and differ in textures [1]. Thus, CPA occurrence may be related to specifics of the parent body evolution. Notably, CPA are common in type 5 and 6 H chondrites including those that do not display shock metamorphic overprint [1,2], while they do not occur in type 3 chondrites [3].

We surveyed a suite of equilibrated and weak to moderately shocked (S2–3) H chondrites i.e., Bassikounou, Gao Geunie, Juancheng, Pułtusk, Thuathe and Zag for CPA. The chemical composition and structural details of the phases composing the CPA were analyzed by EPMA and Raman spectroscopy.

Results: CPA assemblages of up to ~400 μm in size were found in all analyzed H chondrites. The modal, mineral and chemical composition varies between individual aggregates. Chromite and feldspar are the main constituents and coarse merrillite and, usually, Fe,Ni-metal occur at rims of assemblages. Minor phases are ilmenite, diopside and olivine.

Chromite in CPA forms subhedral crystals up to 20 μm in size with curvilinear boundaries. Commonly the chromites developed triple junctions at the contact to adjacent grains. In many aggregates, joined chromite grains form clusters up to 100 μm in size. In contrast to the rather uniform chemical composition of chromites outside the aggregates, the chromites in CPA vary from one assemblage to another (atomic ratios $Fe^{2+}/(Fe^{2+}+Mg)$=0.51–0.85 and Cr/(Cr+Al)=0.38–0.88).

Plagioclase ($Ab_{79.4}$ $Or_{6.4}$ $An_{14.2}$), interstitial to chromite, contains cryptoantiperthitic intergrowths of potassium feldspar (kfs; $Ab_{8.9}$, $Or_{84.7}$ $An_{6.4}$). Raman spectroscopy of the kfs revealed it has structure of badly ordered sanidine, in some places slightly ordered orthoclase (two well defined peaks and sometimes third, weak peak in the region 450–512 cm^{-1}) [4].

Discussion: Structure and composition of the criptoantiperthite in CPA shows it apparently formed by exsolution during cooling with inferred intermediate cooling rate in range 700–500ºC [5]. It is in agreement with the curvilinear form of well recrystallized chromite grains in CPA. This may show that the assemblages were influenced by residual impact heat in hot ejecta blanket or beneath the crater floor. As they associate with metamorphic minerals (merrillite), they likely formed in early history of the parent body. As such scenario involves annealing, it is reasonable that CPA are found only in recrystallized, equilibrated types of H chondrites.

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