

PSEUDOTACHYLITIC MELTING AND UNMIXING OF SILICATE, CARBONATE AND SULFIDE MELTS IN THE PULTUSK H-CHONDRITE.

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Introduction: The Pultusk meteorite is H4-5 S3 chondrite with silicates of typical, equilibrated composition [1, 2, 3]. It was significantly deformed due to shock-related shearing at high strain-rate (without high shock pressures) [3, 4]. In most of the specimens cataclastic, darkened zones occur. The conducted EDS measurements indicate that in such darkened zones, glassy blebs composed of iron-depleted silicate-, iron-nickel sulfide- and carbonate- domains are present.

Iron-pure silicates and iron-nickel sulfides in cataclased zones: In matrix of cataclased parts of chondrite, ~20–120 µm large, irregular blebs occur. They are generally composed of amorphous phases, however, some microcrystallites may also be detected. Such blebs never occur in the light, host part of the chondrite. Modal composition of blebs differs from the host rock's composition as blebs are either completely free of metal and sulfides or contain many laths of iron-nickel sulfides. Silicate glasses in blebs have generally composition of enstatite (En_{94,1±2,6} Fs_{5,0±2,9} Wo_{0,9±0,3}) and iron-pure diopside (En_{52,9±7,4} Fs_{4,2±2,5} Wo_{42,9±8,0}) and in some cases of forsterite (Fo_{98,6±0,5} Fa_{1,4±0,5}).

The composition of the silicates in the vicinity of all of these objects is typical for H chondrite (En_{80,5}Fs_{17,5±1,6}Wo_{2,0±1,5} and Fo_{80,7}Fa_{19,3±1,2}). No transition zone is observed.

Carbonates inside of blebs: In one of blebs, CaO-rich microcrystallites occur. Their composition is: SiO₂ – 0,22; FeO – 0,85; MgO – 0,05 and CaO – 54,79 wt%. They are most likely calcitic because of carbon contents.

Discussion and conclusion: Blebs of such iron-pure silicate composition are hardly expected in a thermally equilibrated chondrite and must postdate nebular and accretional processes. The composition of blebs can not be related to enstatite chondrite projectile as sulfides in blebs do not contain normally lithophile elements. The origin of calcite seems to be the most mysterious problem. Origin as weathering product [5] is excluded as specimens are fresh finds and blebs occur inside them

Since blebs occur only inside zones with the obvious evidence of cataclasis, they may be related to pseudotachylitic melting and unmixing due to high strain-rate impact event. It seems that three immiscible melts then unmixed: magnesium-silicate, iron sulfide and carbonate. The origin of carbon is however unknown. Moreover, pseudotachylitic melting is likely as such unmixing of silicate and sulfide/carbonate melts occur in terrestrial impact structures [6, 7] and iron-depleted glasses have been formed in H chondrite deformed at high strain-rate [8].

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