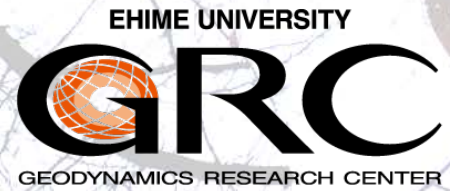


Mineralogical study of micro-inclusions in olivine in pallasite meteorite

Yoshie Takayama (Msc student, Ehime University)

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Pallasite, a type of stony-iron meteorites, consists of olivine, Fe-Ni alloy and some minor minerals. Its characteristic mineral assemblages and texture have attracted the attention of many meteoriticists and mineralogists. Pallasite meteorites have been thought to be originated from a silicate-metal mixture ("pallasite layer") that formed as a result of magmatic differentiation at the core-mantle boundary of parental planetary bodies. On the other hand, some recent studies suggest that the parent bodies of pallasite were formed by mechanical mixing of two or more asteroids having different mineralogical compositions (e.g. iron and stony meteorites) through their extensive impact(s). However, the origin and the formation process of pallasite meteorites have still been unclear.

In this study, we investigate a main-group pallasite meteorite, Seymchan discovered from the Yasachinaya river in Russia to study the microtexture and chemical composition using SEM-EDS and TEM-EDS. In particular, we focus on micro-inclusions in olivine grains, which were reported from other pallasite meteorites by some earlier studies, but the origin of such micro-inclusions has not been fully understood.

The micro-inclusions in olivine in Seymchan mostly show droplet morphologies, and are often aligned linearly in the host olivine grains. They are most likely crack-filling secondary inclusions that formed during or after pallasite formation. SEM-EDS analysis showed that the droplet-inclusions consist mainly of troilite ((Fe,Ni)S), Fe-Ni phases (kamasite and taenite) with a small amount of stanfieldite ($\text{Ca}_4(\text{Mg, Fe})_5(\text{PO}_4)_6$), chromite((Mg, Fe)Cr₂O₄), schreibersite ((Fe, Ni)₃P) and tridymite (SiO₂) as minor phases. In the talk, I will present the occurrence, microtexture and chemical composition of these mineral assemblages and discuss the origin and formation process in addition to the significance in understanding the formation mechanism of pallasite meteorites.