[EJ] Evening Poster | P (Space and Planetary Sciences) | P-PS Planetary Sciences

[P-PS06]Formation and evolution of planetary materials in the Solar System

convener:Akira Yamaguchi(National Institute of Polar Research), Wataru Fujiya(Ibaraki University, College of Science), Yoko Kebukawa(横浜国立大学 大学院工学研究院, 共同), Masahiro KAYAMA(Department of Earth and Planetary Material Sciences, Faculty of Science, Tohoku University)
Wed. May 23, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)
This session will focus on the evolution in the Solar System with interaction and co-evolution in minerals, water, organic matter, and noble gas in meteorites and interplanetary dust particles. New innovative analytical and theoretical techniques in various fields will be discussed. The developing methods are welcome to submit for the future mainstream of meteorite study. In order to explore the planetary materials and their evolution, both meteorite studies and experimental approaches are necessary. In this session, we will discuss these topics from extraterrestrial sample analyses and experimental works. Research works on undifferentiated and differentiated meteorites and parent body processes such as aqueous alteration, thermal metamorphism, shock metamorphism, volcanic activity, and core-mantle-crust differentiation are especially included in this session.

[PPS06-P11]Compositional fluctuation of silicate minerals in formation processes of artificial cosmic spherules

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Micrometeorites (MMs) have the largest flux of planetary materials falling to the earth. Cosmic spherules (CSs) are spherical MMs melted by heating at the atmospheric entry. CSs experienced extraordinary quick quench processes following various degree of melting. In this study, quick heating and cooling experiments of powdered meteorite were carried out with a fine particles free falling apparatus with controlled gas flow (Isobe and Gondo, 2013). Oxygen fugacity was controlled to FMQ +1.5 log unit to represent approximately 90 km altitude in the terrestrial atmosphere. Particles can be heated to the maximum temperatures of 1400°C or 1500°C within two seconds, are kept approximately one second and quenched within a second.

Run products are quite resemble to natural CSs. Olivine crystals in meteorite with various Mg/Fe compositions in Fo60 to 90 were melted depending on the phase relation of olivine solid solution. Compositions and texture of recrystallized olivine show crystallization process in quick quench. Forsterite component if recrystallized olivine is concentrated to Fo 70 to 85. Pyroxenes in meteorites show also various compositions including orthopyroxene, pigeonite and augite. However, pyroxene phenocrysts in reproduced CSs are only relict enstatite. Pyroxene quench crystals are scarcely occur in the run products. Plagioclase phenocrysts with Na-rich composition (Ab 78 to 98) in meteorites were also melted by heating. Plagioclase phenocrysts in run products show various compositions in Ab 10 to 60.

Melting of silicate minerals follow phase relations of each mineral species even in extraordinary quick heating and short durations of melt. Compositions of olivine growing in the quick recrystallization process show strong disequilibrium. Recrystallized plagioclase composition is enriched in Ca due to Ca supplied by melting

of clinopyroxene. Textures of CSs are depending on melting degree of the source materials. Mineralogical texture is also depending on thermal history and oxidation by atmosphere. Compositions of recrystallized phenocrysts in CSs should be resulted in quick quenching processes.