[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-P12]Reproduce of I type cosmic spherules from iron meteorite powder

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Micrometeorites (MMs) are extraterrestrial dust particles falling on the earth (Genge MJ and Engrand C, 2008). Fragile micrometeoroids were heated and melted to form small particles during their atmospheric entry (Genge MJ, 2016). And the completely melted MMs are called as cosmic spherules. It can be an extremely valuable sample for us to look into the asteroids and comets providing interplanetary dust particles.

Cosmic spherules show substantial diversity in textures, compositions and morphology which results from the heating process. Generally, the iron-rich spherules (I-type), one group of the cosmic spherules, mainly contain iron oxides wüstite and magnetite, and also frequently involving Ni-rich metal bead that may lost and remain a single large spherical void inside the spherules (Genge MJ, 2016).

In order to reproduce I type cosmic spherules, in this study, we carried out rapid heating and quenching experiments on powders from iron meteorite Canyon Diablo by falling through the high temperature furnace with controlled gas flow (Isobe and Gondo, 2013). Starting material particles are a mixture of kamacite and taenite and trace of mineral schreibersite. Oxygen fugacity was controlled to FMQ +1.5 log unit. Maximum temperature of the particles was approximately 1600°C for about 0.5 seconds. Run products are retrieved from the bottom of the furnace tube.

Run products from iron meteorite particles exceedingly resemble the textures of I type cosmic spherules. Most of run products show rounded to subrounded outer shape and smooth surface which means that these particles were completely to partially melted. Surface tension of the iron and iron oxide melt conduce to the spherical shape in completely melted ones. Oxidized iron forms magnetite crust covering

the molten spherules from one side to opposite partly. In some spherules that are partially melted, small peaks can be seen on the surface.
In run products, chemical compositions of oxide crust and metal beads are differentiated from starting material. In starting material, the Ni content range from 1-12 % and most of them occur between 6-8 % in mass composition. The Ni content of most of metal beads are at around 7 to 8 %. Ni-rich taenite crystals, which Ni content reach 33-57 %, also occur. While in iron oxide, it range from Ni free to 16 %, most of them spread between 0-2 %. The Ni content in the iron oxide can reach up to 42 % in Ni concentrated vein. Oxidation conditions and fractionation processes of Fe and Ni can be discussed from textures and compositions of I type cosmic spherules based on the results of this study.