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PPS22-P10 Room:Convention Hall Time:May 27 18:15-19:30

Attempt to Extract and Identify Weak-magnetic and Ferro/Ferri-magnetic Grains Included in Chondrites by Magnetic Force.

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The effect of magnetic force caused by a field gradient has been commonly used to extract ferro (ferri)- magnetic materials from grain ensembles. The extraction was realized because the forces that operated on the spontaneous magnetizations of these materials were exceedingly large compared to terrestrial gravity. Chondrites are formed from ensemble of grains with different chemical composition, and the origin of grains is considered to be heterogeneous. At an initial stage of investigating this type of sample, it is desirable to extract and identify the material of individual particles included in the ensemble. Such method should be non- destructive and easily performed; it should be conducted by a well-established physical or chemical concept. In the case of analyzing a heterogeneous organic solution, the process of extraction and identification has been well established by introducing the technique of chromatography; such method has not been established as yet on a mixture of heterogeneous solid-grains.

A principle was proposed to identify the grain efficiently, which was driven by magnetic volume force[1][2]. When an ensemble of heterogeneous grains is released at a point located in a monotonously decreasing field, the grains are expected to be separated into multiple groups of ensembles as they translate toward an area of B = 0. Each ensemble is consisted by a single material, which is identified by comparing the measured χ with a list of published values.

Here we extend the above-mentioned method on paramagnetic silicate grains that compose the chondrites by extracting and identifying the individual grains by the difference of their Fe mol %. The concentration of Fe is considered as an indicator to estimate the extent of evaporation and condensation in the course of individual grain formation. The size of particles was about 100-800 μm. Microgravity was generated by a compact drop shaft system having length of the shaft was 1.8m; duration of microgravity time was about 0.5 second. The experimental apparatus was set inside a rectangle box which had a size of 30 x 30 x 20 cm. Interior of the box consisted of a vacuum chamber equipped with an electric actuator, a sample holder controller, a magnetic circuit, a battery, and a high-vision video camera. The compact setup was realized by introducing a magnetic-circuit that was composed of small NdFeB permanent magnets. Maximum field intensity of the circuit was 0.7 T. The result achieved here on sub-mm-sized diamagnetic grain provides a technical basis to extend the analysis on micron-sized grains that compose the chondrites. It may be applied to search new types of pre-solar grains that are not identified as yet.

Reference

[1] K. Hisayoshi, S. Kanou and C. Uyeda : Phys.:Conf. Ser., 156 (2009) 012021.
[2] C. Uyeda, K. Hisayoshi, and S. Kanou : Jpn. Phys. Soc. Jpn. 79 (2010) 064709.

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