

# Nanometer-scale paleomagnetism of meteorites using electron holography

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Remanent magnetization of minerals is very sensitive to the formation and experienced environments such as temperature and magnetic field. To better understand the formation environments of individual extraterrestrial minerals, we attempted to apply the electron holography to nanoparticles extracting from a meteorite. As the result, we succeeded to elucidate a magnetic structure of framboidal magnetite, which has been aligned periodically in three-dimensionally and proposed its formation process in a parent body of the Tagish Lake meteorite [1]. This method will allow us to reveal formation temperature of individual tiny minerals in the solar nebula and precipitation temperature of individual minerals during thermal aqueous alteration inside a corresponding asteroid. More recent years, several reports about paleomagnetic studies of meteorites has been reported [e.g. 2]. Here, we will show our present approaches to visualize the magnetic structures of individual extraterrestrial minerals and to constrain its formation environment, which was not unveiled by conventional paleomagnetic studies using a bulk mineral.

[1] Yuki Kimura et al., Nature Communications, 4 (2013) 2649.

[2] J. Bryson, et al., Earth and Planetary Science Letters, 388 (2014) 237.

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