R004-15
Zoom meeting A ：11/4 PM1 （13:45-15:30）
14:45-15:00

Evolution of CV chondrite parent body inferred from magnetization of clasts in Yamato-86009 chodrite with SQUID microscope

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Chondritic meteorites have long been regarded as originated from undifferentiated asteroids based on their textures and chemical compositions. However, paleomagnetic studies of CV chondrites have shown that their natural remanent magnetization (NRM) was acquired after accretion of their parent asteroids suggesting that their parent body had molten core generating a dynamo magnetic field (e.g., Elkins-Tanton et al., 2011). There is an alternative explanation that an impact-generated field or nebula field was recorded during transient heating in the matrix of CV chondrite (Muxworthy et al., 2017). It is known that lithic clasts are contained in the matrix of CV chondrites as olivine-rich aggregates, which is considered as originated from the CV chondrite parent body. Jogo et al. (2019) suggested that the clasts experienced high-temperature metamorphism (>800 degrees C) in the interior of the CV parent body based on thermal modeling and the similarities of isotopic, chemical and mineralogical compositions between clasts and matrix of CV3 chondrites. Here, we present an ultra-high-sensitive paleomagnetic study of the individual clasts for the first time using the Yamato-86009 Chondrite with a scanning SQUID microscope in order to constrain the magnetic history of the CV chondrite parent body.
Rock magnetic and paleomagnetic analyses were made on oriented clast samples extracted from a thin section of the Chondrite as well as the matrix. Low temperature magnetometry on selected clast and matrix samples suggests that the magnetic minerals contained are magnetite and pyrrhotite.
Paleomagnetic intensities and directions of natural remanent magnetization (NRM) of the clast and matrix samples were calculated based on the scanning SQUID microscope measurements on the samples assuming that the magnetic field is dipolar. Progressive alternating field (AF) demagnetization experiments were conducted on the clast and matrix samples and three components of magnetizations were identified; i.e. low coercivity (LC; 0-1.5 mT), medium coercivity (MC; 1.5-20 mT), and high coercivity (HC; 20-60 mT) components. LC may correspond to viscous remanent magnetization acquired in the laboratory, in the repository and/or at the meteoritic strewn fields. Only three clast and two matrix samples provided stable MC and HC components. MC components of the clasts and matrix had identifiable stable paleomagnetic directions. The two clasts and two matrix samples retained up to about 90 % of its magnetization. Only the two MC components have a similar paleomagnetic directions; the rest of clast and matrix show a random magnetization distribution. HC components of the clasts and matrix are relatively unstable compared to MC components. Each clast and matrix have different HC component paleomagnetic directions.
Magnetic coercivity component identification based on decomposition of isothermal remanent
magnetization (IRM) at 20K and 40K across the low-temperature transition for pyrrhotite (Besnus point: about 34K) suggests that matrix contain considerable amount of PSD (vortex state) pyrrhotite (peak coercivies of about 40 mT) , whereas clast contain only minor amount of PSD pyrrhotite but considerable amount of PSD magnetite (peak coercivies of about 25 mT). HC corresponds to SD magnetite based on decomposition of IRM. Relative paleointensity will also be estimated using NRM and IRM experiments. We discuss possible scenarios on the meteorite parent body based on MC and HC paleomagnetic components and relative paleointensity.