NORTHWEST AFRICA 1232—A CO3 CARBONACEOUS CHONDRITE WITH TWO LITHOLOGIES

Miho Kiriishi and Kazushige Tomeoka. Department of Earth and Planetary Sciences, Faculty of Science, Kobe University, Nada, Kobe 657-8501, Japan. E-mail: miho@stu.kobe-u.ac.jp

Introduction: Northwest Africa (NWA) 1232 has recently been classified as a CO3 carbonaceous chondrite. A striking feature of NWA1232 is that it consists of two different lithologies (A and B). NWA1232 may therefore be a polymict breccia, and if so, this meteorite may provide new insight into the carbonaceous chondrite parent body and its formation history. We present the results of our mineralogical and petrographic study of NWA1232. Our goal was to determine the chemical and petrologic types of the two lithologies and how these are related to each other.

Results: Both lithologies A and B contain well defined chondrules set in a fine-grained matrix. The modal abundances and the average diameters of chondrules in lithologies A and B are consistent with those of the CO type carbonaceous chondrites [1].

*Lithology A***.** Olivine phenocrysts in type I chondrules are mostly Mg-rich ($Fa_{4–15}$). In some chondrules, plagioclase in mesostasis contains minor amounts of nepheline as thin lamellar intergrowths. In the CAIs, in addition to primary minerals such as melilite, spinel, and anorthite, nepheline has been formed by replacing melilite and anorthite. Olivine grains in the matrix are Fe-rich and heterogeneous ($Fa_{41–59}$).

*Lithology B***.** Type I chondrules have texture and mineralogy generally similar to those in lithology A. However, olivine phenocrysts are more Fe-rich ($Fa_{20–40}$) than those in lithology A. Mesostases have been more extensively replaced by nepheline than those in lithology A. The size and texture of CAIs in lithology B are also similar to those in lithology A. However, melilite is absent, and anorthite is rare. Nepheline is much more abundant. The matrix in lithology B consists of minerals similar to those in lithology A. However, olivine grains are relatively more Fe-poor and homogeneous ($Fa_{38–44}$) than those in lithology A.

Discussion: Both lithologies A and B can be classified as type CO3. However, olivine in lithology B chondrules is more enriched in Fe than in lithology A, whereas olivine in lithology B matrix is more depleted in Fe than in lithology A. Chondrules and CAIs in lithology B show a higher degree of nephelinization than those in lithology A. Previous studies suggested that nephelinization in these objects is correlated with thermal metamorphism of their host chondrites [2−4]. We therefore conclude that these differences are related to the difference in degree of thermal metamorphism.

These two lithologies probably represent rocks that have been thermally metamorphosed at different locations within a single CO parent body and later mixed to form the present combined rock during a brecciation process. Our results thus suggest that the CO parent body has undergone a heterogeneous distribution of its metamorphic condition, and a brecciation process has subsequently occurred in the parent body. The results further suggest that the CO3 chondrites of different subtypes from 3.0 to 3.8 [5] constituted the same, single parent body.

References: [1] Brearley A.J. and Jones R.H. 1998. *Planetary Materials* pp.3-1 to 3-398. [2] Kojima T. et al. 1995. *Proceedings of the NIPR Symposium on Antarctic Meteorites*, 8:79−96. [3] Russell S.S. et al. 1998. *Geochimica et Cosmochimica Acta*, 62:689−714. [4] Tomeoka K. and Itoh D. 2004. *Meteoritics & Planetary Science*, 39:1359−1373. [5] Chizmadia L.J. et al. 2002. *Meteoritics & Planetary Science*, 37:1781−1796.