FIRST OBSERVATION OF DMISTEINBERGITE IN METEORITES: IMPLICATION FOR HYDROTHERMAL ORIGIN INSIDE OF PARENT BODY.

K. Fintor[1], SZ. Nagy[1], H. Walter[1], E. Pál-Molnár[1] and A.N. Krot[2]

[1]Szeged University, Department of Mineralogy, Geochemistry and Petrology, Egyetem u. 2-4., 6720 Szeged, Hungary.

[2]Hawai'i Institute of Geophysics and Planetology, School of Ocean, Earth Science and Technology, University of Hawai'i at Mānoa, Honolulu, HI 96822, USA

Introduction: The CV3 carbonaceous chondrites are among the most investigated meteorite type on the Earth [1]. Here, we present the petrographical and micro-Raman analysis of chondrules and (Ca,Al)-inclusions (CAI's) of the NWA 2086 CV3 carbonaceous chondrite, as well as the first evidence for attendance of the dmisteinbergite (hexagonal $CaAl_2Si_2O_8$) as refractory mineral in a CV3 chondrite.

Results and Discussion: *(Ca-Al) rich inclusions:* Three different type of CAI's can be distinguished in the sample.

Spinel rich type CAI's made by very small size (few 10 μm) grains. In this type anhedral spinel agglomerates are the major constituents. Tiny (3-5 μm) circular perovskite inclusions can be found in the inner part of this agglomerates. The spinel agglomerates are embedded in fine grained clinopyroxene assemblage exhibiting hedenbergite-diopside composition. Micropores are occuring frequently in the clinopyroxene assemblage. Subordinately, forsteritic grains with submicron size ilmenite are also occurring in this type. Sodalite and nepheline as secondary minerals are also occurring rarely in the clinopyroxene assemblages.

Type 2: CAI's are also containing fine mineral grains however spinel is occurring much lesser amount than in the spinel rich type. In these inclusions clinopyroxene assemblages are the main constituents. Andradite garnet can be found as identical grains or in a center of diopside-hedenbergite aggregates. Perovskite are also occurring as small (3-5 μm) inclusions in diopside/augite assemblages. Forsterite grains with diopsidic rim are also occurring subordinately.

The third type CAI's are made by large (>100 μm) anhedral to tabular shaped crystals and fine grained crystal aggregates are occurring interstitially among larger crystals. The large grains are gehlenites which contain small (~10 μm) spinel and perovskite (4-5 μm) grains and they are embedded poikilitic in gehlenite. The fine grained aggregates contain high temperature phases as well as anortite and diopside-hedenbergite and low temperature secondary phase together with grossular garnet.

Among the clinopyroxene-grossular and spinel-gehlenite assemblage can be observed the dmisteinbergite by Raman spectroscopy which is a hexagonal form of $CaAl_2Si_2O_8$. **(Fig. 1).**

The refractory mineral dmisteinbergite (hexagonal $CaAl_2Si_2O_8$) has not yet been detected in meteorite before. This mineral along with its polytype svyatoslavite (monoclinic $CaAl_2Si_2O_8$) is only described from the Earth or as a synthetic phase. In the nature, the dmisteinbergite can be found in high temperature and hydrothermal environment also [2].

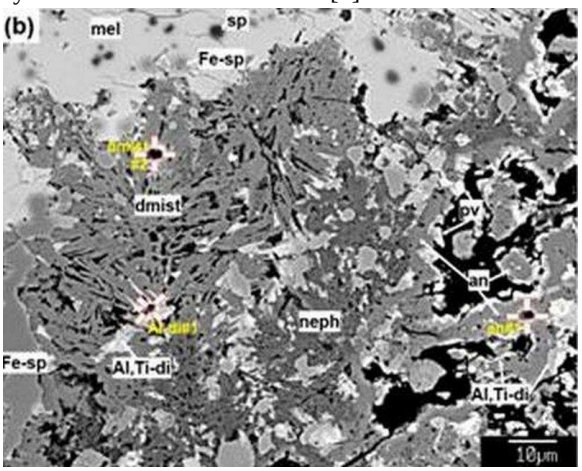

Fig. 1. *BSE image of dmisteinbergite from NWA 2086 CV3 carbonaceous chondrite. Acicular dmisteinbergite replacing melilite associates with the secondary nepheline and sodalite.*

Conclusions: The mineralogy and petrography of dmisteinbergite suggest that this mineral is probably a common secondary phase in CAIs from the oxidized Allende-like CV chondrites that has been previously misidentified as anorthite.

References: [1] McSween H. Y. (1977) *Geochim. Cosmochim. Ac., 41,* 1777-1790. [2] Nestola, F., Mittempherger, S., Di Toro, G., Zorzi, F., and Pedron, D. (2010) *Am. Mineral*. 95, 405-409.