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Ti, Al-RICH Ca-PYROXENE ASSEMBLAGES IN CAIS.

C. E. Nehru[1,3], M. K. Weisberg[2,3] and D. S. Ebel[3]. [1]Dept. of Geology, Brooklyn College, CUNY, Brooklyn, NY 11210; Nehru@brooklyn.cuny.edu; [2]Dept. Physical Sciences, Kingsborough College, CUNY, Brooklyn, NY 11235; [3]Earth and Planetary Sciences, American Museum of Natural History, New York, NY10024.

Introduction: We have started a survey of the textures, mineral compositions, and petrology of Ti, Al-rich Ca pyroxene and coexisting melilite in a suite of refractory inclusions (compact and fluffy Type A) from CV (Leoville, Allende, Efremovka, Vigarano, NWA 2364), CO (Lance) and CR (Gao-Guenie B and EET92105) Chondrites. We are particularly intrigued by the remarkably high Ti content in some of the pyroxene in CAIs and its significance in understanding CAI formation. These are our preliminary results.

Results: The CAIs we studied vary in sizes from a few tens of microns to a few millimeters across with variable shapes - irregular to oval to circular - and provide good evidence for a single, generally concentrically layered sequence of minerals related by successive condensation/crystallization processes. The core to rim sequence generally recorded is: perovskite + MgAl spinel ± hibonite, then melilite + Ca-pyroxene, and finally MgAl-spinel. The complete sequence may be missing or vary in some CAIs, but the general pattern remains. In addition, some contain Wark-Lovering rims.

In ***fassaitic pyroxene*** the, Ti^{3+} with Ti^{4+} were recalculated as by [1]. Fassaite composition variations from one CAI to another and sometimes within the same CAI are common. TiO_2 values vary from a few percent to a maximum of about 14 wt% and Al_2O_3 up to about 30 wt% are noted. Al and Ti values in a given CAI are positely correlated, and Al is negatively correlated with Mg. Fassaite with up to 13.64 wt % $Ti0_2$ and 22.77 wt % Al_20_3 occurs in the Type A compact inclusion of CR2 Chondrite EET92105 as reported by Weisberg et al. [2]. Fassaites from EET 92105 are uniform. ***Melilite*** is the most abundant component in the CAIs we studied. The association of melilite and Mg-Al-spinel with fassaite is most common. Melilite compositions vary, with normal zoning (X_{Ak} increasing towards rims) frequent. The Ak content correlates positively with CaTs in coexisting fassaite.

Discussions and Conclusions: The origin of Type A CAIs has been debated for some time now. The current study (limited to CV3, CO3 and CR2 chondrites) adds to the existing textural and mineralogical evidence that points to a high temperature origin with successive layers approaching equilibrium with surrounding vapor. The sequence of minerals observed is in general agreement with the calculated sequence of equilibrium condensation [3]. Our data set is not yet large enough to warrant a blanket statement. For example, Efremovka 101.1 is a rare CAI studied by [4] and we have not come across one like it in our samples of Efremovka. We will be refining our conclusions as we gather more information on the subject.

References: [1] Beckett J.R. 1986. PhD Thesis, U. Chicago [2] Weisberg et al. Meteoritics v.39 No. 10 [3] Ebel D.S. & Grossman L. 2000. *Geochim. Cosmochim Acta* 64:339-366. [4] El Goresy et al. 2002. *GCA* **66**: 1459-1491.