REPLACEMENT OF CHONDRULE-HOSTED OLIVINE AND PYROXENE BY SERPENTINE DURING AQUEOUS ALTERATION OF LEWIS CLIFF 90500 AND ALLAN HILLS 85013. M. A. Velbel[1,2], E. R. Miciuda[1], and S. A. Curtis[1], [1]Department of Earth and Environmental Sciences, Michigan State University, East Lansing, MI 48824 USA (velbel@msu.edu), [2]Department of Mineral Sciences, National Museum of Natural History, Smithsonian Institution, Washington, DC 20560 USA.

Introduction: Some phyllosilicates in CM carbonaceous chondrites formed by aqueous alteration of anhydrous precursor phases (e.g., [1-7]). Although broad trends in the compositions of hydrous phyllosilicates are recognized and believed to be related to trends in degree of aqueous alteration [2,8], details of the reactions that formed specific secondary minerals remain topics of ongoing scientific interest.

This presentation reports compositional relationships between remnants of partially pseudomorphically (or alteromorphically; terminology of [9]) replaced silicates and their alteration products (serpentine) in the CM2 chondrites Lewis Cliff (LEW) 90500 and 93005 and Allan Hills (ALH) 85013, and compares them with previously published results for ALH 81002 [4], Nogoya [5], Queen Alexandra Range (QUE) 93005 [7], and Paris [10,11]. By focusing on serpentine formed from known specific reactants (olivine, pyroxene) of known composition, and on only those instances in which some of the reactant silicate remains, direct compositional relationships between reactants and products, and the elemental mobility required by the reactions, can be established [5-7,10,11].

Methods and Materials: Reactants and products were characterized by optical petrography and backscattered scanning electron microscopy (BSEM). LEW 90500 (CM2) has properties between CM2.2-2.4 in one CM classification scheme [7,12] and is classified as CM1.6 in another [13]. In ALH 85013 (CM2) [14], serpentine group minerals constitute 77.8% of this meteorite and likely formed by complete replacement of anhydrous silicates during aqueous alteration [15].

Results: *LEW 90500.* The sample examined for this study contains porphyritic, granular, and barred olivine (PO, GO, and BO) chondrules. PO±P have forsteritic olivine with thin (~1-4 μm thick) meshwork serpentine separated from microdenticulated anhydrous silicate remnants by peripheral voids. The meshwork's Z-contrast varies within and among different olivines and hondrules. Mesostasis is commonly altered. These chondrules have fine-grained rims (f.g.r.s) ~10-70 μm thick.

A PO chondrule with ferroan olivine exhibits peripheral partial-pseudomorphic replacement by low-Z serpentine thickest (~6-8 μm thick) along one crystallographic direction, and undetectably thin perpendicular to it, and one (1) ~10 μm meshwork-like replacement by higher-Z serpentine along a fracture. Olivine-serpentine interfaces are smooth. This chondrule has a ~30-50 μm thick f.g.r.

An isolated ferroan olivine exhibits corrosive replacement of olivine by serpentine. This object has a ~40 μm thick f.g.r. around ~75% of its perimeter.

ALH 85013. The sample examined contains PO, GO, and BO chondrules. The smaller chondrules tend to be more rounded, the larger chondrules less so. Olivine commonly exhibits compositional zoning. Chondrules commonly exhibit non-uniformly (20-150 μm) thick f.g.r., radially fractured in some instances. Porphyritic anhydrous magnesian silicates have thin (~1 μm thick) low-Z meshwork and peripheral voids around microdenticulated remnants.

Ferroan olivine is compositionally zoned and exhibits size-dependent partial (large) and complete (small) pseudomorphism by serpentine. Coarse ferroan olivine has peripheral partial-pseudomorphic replacement by low-Z serpentine thickest (~6-8 μm thick) along one crystallographic direction, and undetectably thin perpendicular to it. Interfaces between partially replaced ferroan olivine and serpentine are smooth.

Ongoing work: Future work includes but is not limited to electron probe microanalysis EPMA of texturally (pseudomorphically) and thus genetically related olivine-serpentine pairs. Serpentine compositions to be determined may establish similarity or difference of the aqueous geochemical environments within which serpentine replaced coarse chondrule-hosted anhydrous silicates between these meteorites and other CM2s previously similarly examined [4,5,7,10,11].

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