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Evidence Of Metasomatism In The Lowest Petrographic Types Inferred From A Na-, K, Rich Rim Around A LEW 86018 (L3.1) Chondrule.

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Abstract Text:

Ordinary chondrites (OCs) represent the most abundant extraterrestrial materials and also record the widest range of alteration of primary, pristine minerals of early Solar system material available for study. Relatively few investigations, however, address: (1) the role of fluid alteration, and (2) the relationship between thermal metamorphism and metasomatism in OCs, issues that have been extensively studied in many other meteorite groups e.g., CV, CO, CR, and enstatite chondrites. Detailed elemental abundances profiles across individual chondrules, and mineralogical studies of Lewis Hills (LEW) 86018 (L3.1), an unequilibrated ordinary chondrite (UOC) of low petrographic type of 3.1 returned from Antarctica, provide evidence of extensive alteration of primary minerals. Some chondrules have Na-, K-, rich rims surrounded by nepheline, albite, and sodalite-like Na-, Cl-, Al-rich secondary minerals in the near vicinity within the matrices. Although, limited evidences of low temperature (~250°C) fluid-assisted alteration of primary minerals to phyllosilicates, ferroan-olivine, magnetite, and scapolite have been reported in the lowest grades (<3.2) Semarkona (LL3.00) and Bishunpur (LL3.10), alkali-rich secondary mineralization has previously only been seen in higher grade >3.4 UOCs. This preliminary result suggests highly localized metamorphism in UOCs and widens the range of alteration in UOCs and complicates classification of petrographic type and extent of thermal metamorphism or metasomatism. The work in progress will document the micro-textures, geochemistry (Ba, Ca, REE), and isotopic composition (oxygen, ²⁶Al-²⁶Mg) of mineral phases in chondrules and adjoining objects to help us understand the formation scenario and delineate possible modes of metamorphism in UOCs.

Topic Selection: Non-destructive study of meteorites

Title: Evidence Of Metasomatism In The Lowest Petrographic Types Inferred From A Na-, K, Rich Rim Around A LEW 86018 (L3.1) Chondrule.

Preferred Presentation Format: Poster Requested

Scheduling Request: No

Previously Published?: No

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