The CAI alteration in Mukundpura Meteorite

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Abstract: Carbonaceous chondrite are the primitive meteorite which can provide insights in to the solar system. The CM type meteorite belong to the large carbonaceous chondrites groups provides clues on alteration process in the parent body. The aqueous alteration is well understood in CM and CI type based on the secondary mineralogical characters, viz. phyllosilicates, PCP (poorly characterized phase), carbonates etc. The refractory minerals are also ubiquitous in the CM type meteorite [2]. The recently fall Mukundpura meteorite has been classified as CM2 chondrite [1]. The secondary mineralogy of Mukundpura include phyllosilicate, PCP, calcite, dolomite, phosphate etc. [3,4]. Additionally, a few Calcium Aluminum-rich Inclusion (CAI, mainly spinel, perovskite), the first forming solids in solar system also found as accessory phases. The present study focuses the occurrences of CAI and its alteration mechanism in Mukundpura CM2.

The seven thick polished sections prepared using epoxy were scanned under the SEM (Scanning Electron Microscope) with an operating voltage of 20 keV, 500 pA. The mosaic image using back-scattered images were prepared for all the sections. X-ray images were produced for nearly 10 elements (Ca, Si, Mg, Al, Fe, P, S, Na, K, Ni). The X-ray images were again analyzed using ImageJ software to find the possible location of CAI spots. The identified spots for possible CAI has been then analyzed using Oxford EDS (Energy dispersion spectrometer) attached with the SEM.

Based on chemical characterization and BSE image analysis, we argued that Mukundpura meteorite contain a few refractory minerals and spinel is the most dominant. A few of these spinel grains have been observed with Fe and S rich phyllosilicate intergrowth around them. Some spinel grains were found with depletion in Al_2O_3 and MgO content and suggested for alteration of refractory minerals. As the refractory minerals can provide clue on the solar nebular environment, a detailed mineralogical and isotopic study is warranted for these refractory minerals.

Reference:

[1]. Ray. D. and Shukla A.D, *2018, PSS* [2] Lee M.R. and Greenwood R.C. *MAPS 1994, 780.* [3] Panda et al. *81st Meteoritical Society Meetings 2018, 6270,* [4] Panda et al *82nd Meteoritical Society Meetings 2018, 6420.*