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Confocal Raman Imaging Spectroscopy in Planetary Science – A Perspective

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Confocal Raman Imaging Spectroscopy (CRIS) has provided a significant tool in the armory of planetary scientists over the last decade. The ability to map Raman spectra both on and beneath the surface of samples at submicron resolutions has enabled surprising developments in our understanding of the earth and other solar system bodies. Specific examples include the discovery of water and carbon on the moon, a possible abiogenic explanation for the observations of life in Martian meteorites, altering our understanding of the traces of earliest life on earth, revealing reduced carbon phases in mantle materials and providing unique insights into Stardust returned samples and meteorites including the unique Almahatta sita fall. The unique ability of Raman to look within individual mineral grains means that samples can be analyzed without interference from contaminating phases. Three dimensional and peak center mapping of samples also reveals unique insights into distribution of phases within mineral grains. We present data on the advantages and pitfalls of CRIS for the study of planetary materials and show how this technique combined with modern sample preparation techniques (FIB) can be used to provide submicron scale understanding of samples of interest.