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## Raman Imaging of Extraterrestrial Materials

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**Abstract:** Laser Raman Spectroscopy has been proposed and is under extensive development for surface exploration missions to planetary bodies of our Solar System. It reveals information on molecular structure and chemistry. The spatial distribution of molecular species in natural geological samples and planetary materials has significance for the geological processes by which they formed. Raman imaging is the best way to combine the molecular identification and characterization of geologic materials with their spatial distribution. This paper reports Raman imaging studies of five types of extraterrestrial materials and three terrestrial samples using a state-of-the-art Raman imaging system. The Raman spectral features of major, minor, and trace species in these samples, together with their special correlations revealed by these Raman imaging studies indicate the genetic relationships and the geological processes that these materials have been experienced. For robotic planetary surface exploration mission, a simple yet very useful molecular map of a sample can be generated by using line-scan or grid-scan of an *in situ* Raman system with tightly focused laser beam.

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