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Spectral Characterization of Martian meteorites: Searching for the Source Craters on Mars

There are ~130 confirmed Martian meteorites, yet their source craters on Mars still remain unknown. Locating their source craters would be extremely significant in providing geological context to the only samples from Mars that we have. Geological context is essential if we wish to fully develop our understanding of these meteorites, and therefore develop our understanding of Mars and geological past. Infrared spectroscopy is a powerful remote sensing tool, used in many industries to unravel the composition of target surfaces. NASA and ESA have sent multiple satellite and rover missions to Mars with infrared spectrometers on board, which have generated large global thermal infrared (TIR) datasets of the Martian surface. To use these datasets, you have to compare the bulk spectra acquired from the surface to known terrestrial spectra. In doing so, you can pick apart the Martian surface spectra to determine its mineralogy and composition. There has been limited use of comparing TIR spectra of Martian meteorites directly to the Martian surface. This is due to a number of issues such as the destructive process of acquiring TIR spectra and the rarity of Martian meteorites. However, recent advances in non-destructive analysis has opened up new opportunities. We present new TIR spectra of Martian meteorites acquired using non-destructive micro-Fourier Transform Infrared (μFTIR) spectroscopy. Not only can we acquire TIR spectra of the bulk meteorite, but also its individual mineralogy. This allows us to create our own Martian meteorite mineral spectral library. This can be used to fill in the compositional blanks in the terrestrial mineral spectral library and then also create whole synthetic Martian rock spectra derived from real Martian meteorites to map the surface geology of Mars, and search for their source craters.

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