REFLECTANCE SPECTRA OF RARER METEORITE TYPES

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Introduction

Reflectance spectra of meteorites are the best spectral analogs for asteroids. However, many of the "rarer" meteorite groups are not well represented in our spectral databases. To remedy this situation, we are obtaining reflectance spectra of a number of rarer meteorite types as part of a project to use machine learning to mineralogically classify asteroids using meteorite spectra as a training set [1-3].

Data

All the meteorites were lightly crushed by hand and then sieved to particle sizes less than 125 μm and sent to the Keck/NASA Reflectance Experiment Laboratory (RELAB) at Brown University. Reflectance spectra were measured from 0.32 to 2.55 μm at a sampling interval of 0.01 μm. The incidence angle was 30 degrees and the emission angle was 0 degrees.

Discussion

A relatively large number of the enstatite-rich meteorites have reflectance spectra that appear mostly unweathered (**Figure 1**). All of the spectra appear relatively "flat" and "featureless" due to their virtually FeO-free silicates. Some spin-forbidden bands in the visible are present in some of the spectra. A relatively large number of carbonaceous chondrites of petrologic types 3 to 6 also appear relatively unweathered (**Figure 2**). All of the meteorites have absorption features of varying strength due to olivine. A few of the meteorites have weak pyroxene features centered at ~1.9-2.0 μm. Two of the CM chondrites appear relatively unweathered (**Figure 3**). LAP 031166 has a weak absorption feature centered at ~0.7 μm while MIL 13005 has a number of absorption bands from ~0.7 to ~1.8 μm.

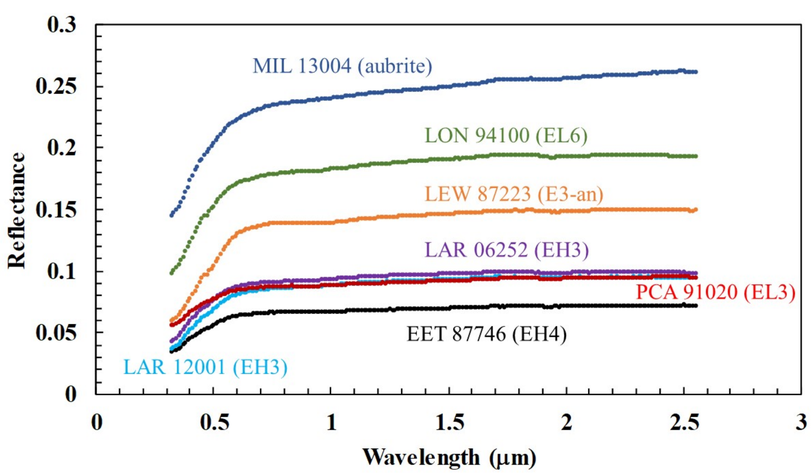

Figure 1. Visible and near-infrared reflectance spectra of the enstatite-rich meteorites.

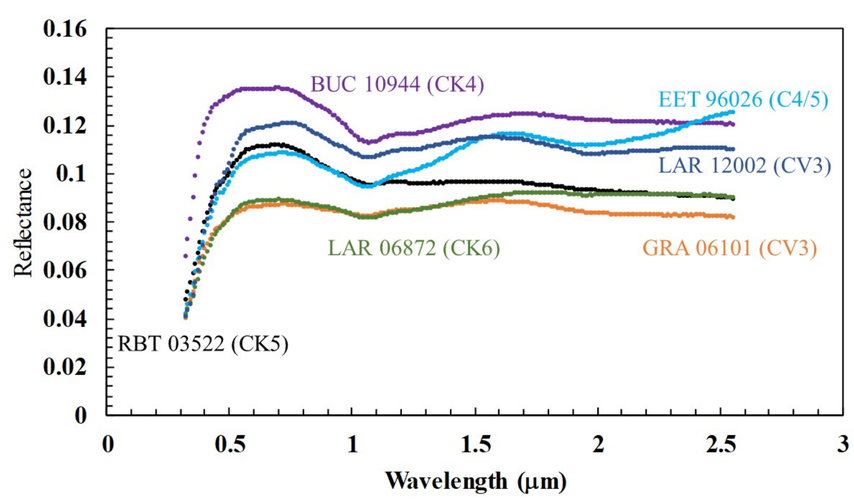

Figure 2. Visible and near-infrared reflectance spectra of the carbonaceous chondrites of petrologic types 3 through 6.

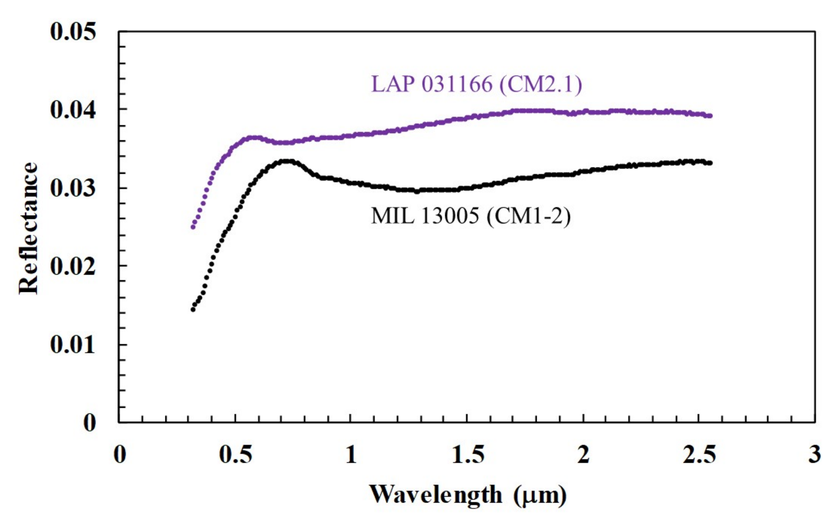

Figure 3. Visible and near-infrared reflectance spectra of CM chondrites.

Conclusions

We are in the process of acquiring more meteorite spectra for a machine-learning project to mineralogically classify asteroids. The spectra presented here show the range of spectral properties of enstatite-rich meteorites and carbonaceous chondrites.

References

[1] Wallace S. M. et al. (2019) LPS 50, Abstract #1097.
[2] Wallace S. M. et al. (2020) LPS 50, Abstract #1036.
[3] Dyar M. D. et al. (2020) LPS 50, Abstract #1037.

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