

Investigating Possibilities for the Blue Spectral Slope Found on B-type Asteroids. M.J. Loeffler^{1,2} and B.S. Prince³, ¹Northern Arizona University, Department of Astronomy and Planetary Science, Flagstaff, AZ, ²Center for Materials Interfaces in Research and Applications, Northern Arizona University, Flagstaff, AZ, ³Northern Arizona University, Department of Applied Physics and Materials Science, Flagstaff, AZ,

Introduction: Remote sensing reflectance spectroscopy has been used for decades to classify and characterizing the surface of airless bodies [1-3]. The most widely utilized spectral region has been the near-infrared (0.7 – 2.5 μm), and within this spectral region, a key characteristic that is used for analysis is the spectral slope of an object.

It seems likely that the spectral slope in this region is altered by solar wind bombardment and micrometeorite impacts. This type of alteration is believed to cause the spectral slope of some asteroids to become red [4-5], but it has also been postulated to be able to cause the spectral slope to turn blue [6-8].

Of course the spectral slope could be affected by other factors. One possible factor is that fine-grained opaque materials (e.g. magnetite and some forms of carbon) mixed with silicates could cause a blue spectral slope in the near-infrared region [9-10]. It has also been shown that the spectral slope of some carbonaceous chondrites can depend on grain size, as some larger grained carbonaceous chondrites with blue or neutral slopes in the visible and near-infrared become red after they are crushed to a smaller grain size [9-10].

Here we are interested understanding whether multiple opaque phases could also cause an asteroid surface to appear blue, how efficient these are with respect to one another and how these changes depend on grain size. For simplicity, we used synthetic forsterite (Fo_{99+}) as our starting sample material and made binary mixtures containing specific amounts of carbon (graphite), Fe_3O_4 (magnetite), or FeS (troilite), while monitoring the spectral reflectance of our sample mixtures between 0.25 and 2.5 μm .

Methodology and Results: To prepare our samples, we used agate mortar and pestle to grind our starting material (if needed) and dry-sieved it to the appropriate grain size. The dark material (troilite, graphite, magnetite) was sieved to grain sizes $<45 \mu\text{m}$, while the Fo_{99+} powder was sieved to either 45 – 125 μm or 500 – 600 μm depending on the experiment. We also used graphite of specific grain sizes (nm- or μm -sized grains), which we did not crush or sieve. Mixtures were quantified using a high-precision analytical balance and reflectance spectra were taken under ambient conditions

using both ultraviolet and infrared spectroscopy from 0.25 to 2.5 μm

Here we will present the spectral evolution of mixtures of interest. Typically characteristics of interest for asteroid spectroscopy, such as the changes in spectral slope and albedo will also be quantified and compared to data currently found in the literature.

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