

EFFECT OF SHOCK ON ASTEROID SPECTRA – ARE DARK ASTEROIDS SHOCKED, OR SPACE-WEATHERED?

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Introduction: On February 15, 2013, an exceptionally bright and long-duration fireball was observed by many eyewitnesses in the Chelyabinsk region, Russia. Two types of meteorite material (light-colored and dark-colored) were recovered. Both are of LL5 composition with the dark-colored being shocked to a higher level (shock darkening). Thus, we can study effect of increasing shock on the physical and spectral properties of a material originating from the same parent body.

Shock Darkening Effects: The bulk and grain densities and the porosity of both meteorite types closely resemble other LL chondrites [1]. Thus, shock darkening does not have significant effect on the material physical properties.

However, there is a change in reflectance spectra observed. Shock darkening causes a decrease of reflectance and decrease in silicate absorption bands in the reflectance spectra (Fig. 1).

This is similar to the space weathering effects observed on asteroids. However, no spectral slope change similar to space weathering is observed as a result of shock darkening. Thus, it is possible that some dark asteroids with invisible silicate absorption bands may be composed of relatively fresh shock-darkened chondritic material.

References: [1] Consolmagno G. et al. (2008) *Chemie der Erde*, 68, 1-29.

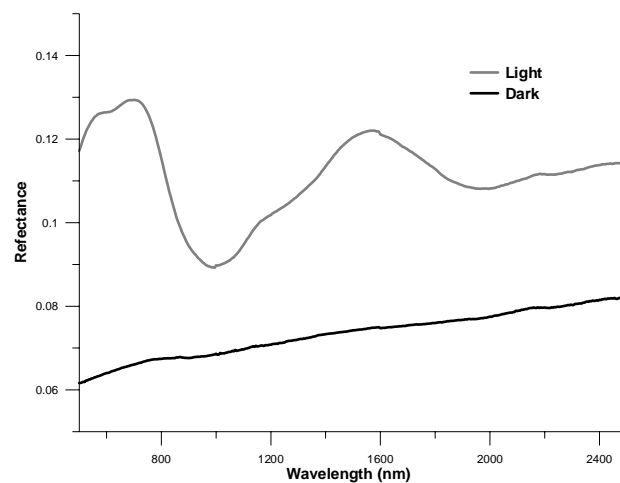


Fig. 1. Reflectance spectra of light-colored and shock darkened Chelyabinsk meteorites.