EFFECTS OF IMPACT ON SOUTH AFRICAN GABBRO. B. E. Clark[1], M. E. Ockert-Bell[1], and M. J. Cintala[2], [1]Dept. of Physics, Ithaca College, Ithaca, NY 14850, bclark@ithaca.edu, mbell5@twcny.rr.com [2]Solar System Exploration Division, NASA Johnson Space Center, Houston, TX 77058, mark.j.cintala@nasa.gov.

Introduction: Evidence of the role of impact in sculpting the histories of asteroids and other small bodies in the solar system mounts as each new object is examined by spacecraft. Not only have these objects attained their current dimensions by collisional disruption of larger bodies (e.g. Chapman and Davis, 1975[1]; Davis et al., 1979[2], 1989[3]; Ryan, 2000[4]), but the majority of their subsequent evolution also can be attributed to impact (e.g. Cintala et al., 1978[5]; Carr et al., 1994[6]; Asphaug et al. 1996[7]; Thomas, 1998[8]). This investiation simulates the effects that high speed impact may have on the asteroid regolith by exploring first the effect on samples, in the first stage we use a gabbro described below.

Sample Treatment: South African Bushveld Gabbro is a reasonable planetary analog (Hörz et al., 1984[9]). It is comprised of 54% (vol.) plagioclase, 22% orthopyroxene, and 13% clinopyroxene as major phases; 5% orthoclase, 5% quartz, and less than 1% each of biotite, ilmenite, and magnetite as minor phases. The original target (referred to as baseline sample #1) was sieved to include grain sizes between 125 and 250 µm. The target was contained between two glass slides and shot with a ceramic pellet from a light-gas gun at 5.742 km/s. The light-gas gun chamber and area in front of the target were lined with aluminum foil to collect ejecta.

After the shot, all material was collected from the shot chamber. The post-shot samples ("Mix" samples) contained any unaffected target as well as constructional fragments that included melt, melt-welded aggregates, and/or aggregates that were sintered under the high pressure and temperature conditions. The largest melt products ("Melt" samples) were collected from the ejecta after the impact and separated by eye using a binocular microscope.

Results: The spectra were measured at RELAB using the 3 instruments: Bi-directional (0.32 – 2.6 µm), Mid-IR (2.5-25 µm) and Far-IR (2.5-50µm). (RELAB ref.). This paper concentrates on the shortest wavelength range only. Figure 1 shows the spectra for grain sizes < 45 µm for the unshot gabbro as well as the mixed sample and the melt sample. Changes in continuum slope for the regions at 0.3 – 0.7 µm and 1.5 – 2.5 µm as well as changes in the absorption features 1 µm and 2 µm can be seen.

Shot Effects This research seeks to categorize the effects of shot impacts on rocks that contain meteorite analogs. The effects of impact speed on the composition as well as grain size will be presented.

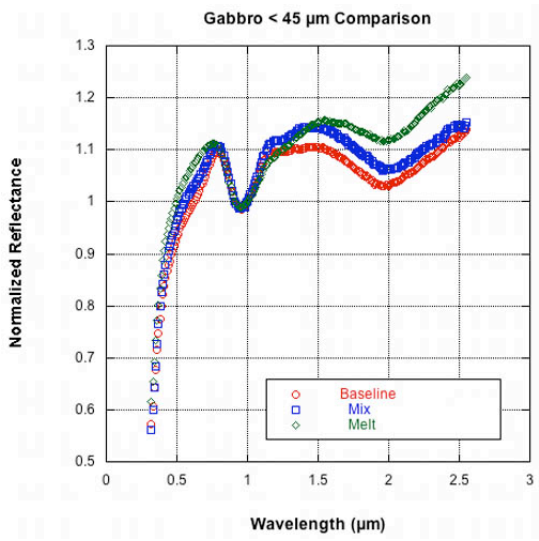

Fig. 1 Comparison of spectra for products with grain size < 45 µm. Spectra are normalized to 1.0 at 1.0 µm. Red circles indicate spectra taken of the baseline sample. Blue squares indicate the spectrum of the mixed sample. Green triangles indicate the melt sample.

References:

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