BASALTIC IMPACTITES FROM LONAR CRATER, INDIA: ANALOGS FOR SHERGOTTITES AND IMPACT MELTS YET TO BE FOUND ON MARS. S. P. Wright, Institute of Meteoritics, University of New Mexico, Albuquerque, NM 87131, spwright@unm.edu

Introduction: The study of shock metamorphism on basaltic minerals [1-3] is of much interest given that our only ~34 samples of Mars are shocked basalts. Identifying the source craters/regions of SNC meteorites [4] is also of interest as we have no sample return and hence no geologic context to compare to the increasing amount of remote data being returned from orbiters. This is a quandary as all shergottites have been shocked ~25-45 GPa, yet all remote data is of pixels of primarily unshocked basalt. Here, petrographic and back scattered electron (BSE) images, along with thermal infrared (TIR) spectroscopy of Lonar Crater impactites are described. Electron microprobe and X-ray Fluorescence data are summarized. Comparisons to and implications for shergottites and data from Mars orbiters and Rovers are noted. For this study, from a previous classification [5], Class 1 (<20 PGa), Class 2 (20-40 GPa) and Class 5 (>80 GPa) shocked basalt, or “impact melts”, have been located.

Petrography and BSE Images: The petrography of Class 1 shocked basalt shows planar deformation features in labradorite laths [5]. Petrographic and BSE images of Class 2 shocked basalt show intense shattering and fracturing of clinopyroxene grains, and labradorite has been converted to maskelynite [2,5]. These data are comparable to the petrography of shergottites [e.g., 6]. Petrographic images of impact melts exhibit schlieren and flow features similar to lechatelierite from Meteor Crater and other terrestrial impact melts.

TIR Spectroscopy: With no mineralogical changes, the TIR spectrum of Class 1 shocked basalt is identical to unshocked Deccan basalt, which has been called an excellent analog for Surface Type 1 (basalt) found in the equatorial regions of Mars [7]. The TIR spectrum of maskelynite-bearing Class 2 shocked basalt is nearly identical to that of the Los Angeles shergottite [4], as the two share a similar mineralogy. Spectral differences between Class 2 and unshocked basalt agree with previous work on the TIR spectra of experimentally shocked plagioclase feldspars and basalts [8]. The TIR spectra of the Class 5 impact melts fall into two spectral types. Both are different from typical high-silica and quenched volcanic basaltic glasses used in TIR analyses [9].

Composition/Mineralogy of Lonar Impact Melts: Whereas the two spectral types of impact melt of have nearly identical oxide abundances, including FeO and Fe2O3, as determined by e-probe and XRF data, BSE images of the two spectral types show only one type has abundant titanomagnetite dendrites.

Implications: Given the laboratory TIR spectral data, links between shergottites and remote data can be made. The grain sizes of shergottites and Lonar Class 2 shocked basalts will also be discussed along with the sampling bias and impact history of Martian rocks.