Study of LIBS Effects on JGb-2 Gabbro Pressed Rock Powder Standard. De Souza, E. Lalla, M. G. Daly, Centre for Research in Earth and Space Science, York University, Petrie Science Building, 4700 Keele St, Toronto, M3J 1P3, Ontario, Canada. (dalym@yorku.ca).

Introduction: Curiosity’s ChemCam is the first use of LIBS in space and represents a significant effort to develop a highly efficient and robust tool for assessing Mars surface compositions up to 7 meters away [1]. Due to design constraints the de facto method for LIBS in space requires the use of calibration standards[1]. JGb-2 is a certified GSJ Geochemical Reference geologic standard Gabbro from Japan. Its composition has been well studied and measured. A JGb-2 pressed rock powder standard from LIRS experiments was selected for Scanning Electron Microscopy(SEM) and Energy Dispersive X-Ray Spectroscopy (EDX) analysis[2][3][4]. There are 6 visible LIBS sites on the standard. A survey of each site was carried out. Stereo imaging with SEM shows surprising topography. Results are discussed here.

SEM Results:

Figure 1: JGb-2 Gabbro Sandstone Standard.

Figure 2: Wide view of all LIBS sites on standard.

Figure 3: Close up images of sites.
3.278 \mu m field of view. SEM Magnification 996X.

EDX Results:

A close visual inspection with the aid of SEM stereo images with grains lying within the alteration zone enabled a sense of depth and shape to be extracted and revealed surprising topography. LIBS sites are usually depressions whose depth is proportional to the number of laser pulses. However, several sites showed both uplift and plateau features with highly irregular elevation curves. There was also clear evidence of grains trapped in the melt matrix along the alteration boundary suggesting a prolonged melting phase.

EDX scans were performed to obtain an elemental composition map. For all sites elemental compositions remained homogenous throughout the alteration zone. Depletion was observed at some sites near the center of the alteration zones (Site 4 and Site 5). Minor depletion zones could be seen at some sites away from the center. These results illustrate the need for more study into the destructive effects of LIBS on targets.

Discussion: A close visual inspection with the aid of SEM stereo images with grains lying within the alteration zone enabled a sense of depth and shape to be extracted and revealed surprising topography. LIBS sites are usually depressions whose depth is proportional to the number of laser pulses. However, several sites showed both uplift and plateau features with highly irregular elevation curves. There was also clear evidence of grains trapped in the melt matrix along the alteration boundary suggesting a prolonged melting phase.

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