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Chemcam Analysis Of Conglomerates At Bradbury Site, Mars

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The ChemCam instrument onboard Curiosity rover is a package of a Laser-Induced Breakdown Spectrometer (LIBS) coupled to a Remote Micro-Imager (RMI). Its main objective is to remotely determine the elemental composition of soils and rocks. Curiosity landed in a location where conglomerates were found at sites named Goulburn_Scour, Link and Hottah. The two RMI images taken at Link were taken at the first and last point of the horizontal raster of 5 points. These clasts show a strong variation in albedo from a minority of dark clast to a majority of light ones. The shape of clasts also varies from very angular shapes including rectangular or acute angles to more rounded pebbles. Each point was submitted to 50 laser shots at the same spot, enable to study variations in depth. We examine first the average composition extracted from the 45 last shots (the first 5 shots are excluded to avoid contamination by dust). Results from LIBS data show the first four points are similar in composition with only little variations. The composition is especially high in Ca, K and Na. Among the pre-Rocknest rock, Link displays a trend toward one of the richest K proportion. The predominance of light-toned grains on the image is explainable by such a feldspathic composition. The fifth point displays a strong variation in composition between first and last shots. This variation is not related to dust, which is observed only in the very first shots (most dust is blasted away by the first one). The composition of the shots 4 to 12 shows a strong enrichment in Fe, Ti, Cr, and a depletion in Si, K, Na, and Ca compared to the 20 last shots that are roughly similar to other Link spectra. The presence of this high Fe-Ti phase in the first shots may then be linked to either a coating, a dark grain, or a cement. The similarity with soils composition, especially the high Fe-Ti suggests this composition may correspond to the matrix cementing grains, that may be present in various amount in all points. Link spectra display also small hydrogen peaks visible at 656 nm that are usually seen on soils and dust, but not in rocks beyond the first shots. Here, all average LIBS points except point 4 show the presence of small H peaks. The shot to shot variations at Link5 suggest a higher H in the cement phase. These gentle peaks may be consistent with the presence of a low proportion (<2%) of hydrated mineral(s), perhaps segregated in the cement. In conclusion, the conglomerate at Link displays light-toned clasts consistent with a feldspathic composition. In a fluvial hypothesis for the origin of the conglomerate, the large feldspathic grains were transported from the rim of Gale crater, therefore supporting a crustal origin for this material. The small but significant hydrogen peaks observed may be related to a short-term aqueous activity perhaps related to the cementing material, but minor phases initially present in the crust are possible alternatives for the presence of this Hydrogen peak.