

Geophysical Research Abstracts
Vol. 15, EGU2013-6272, 2013
EGU General Assembly 2013
© Author(s) 2013. CC Attribution 3.0 License.



Data from the Mars Science Laboratory CheMin XRD/XRF instrument

David Vaniman (1), David Blake, Tom Bristow, and David Des Marais (2), Cherie Achilles (3), Robert Anderson, Joy Crisp, John Michael Morookian, Nicole Spanovich, Ashwin Vasavada, and Albert Yen (4), David Bish (5), Steve Chipera (6), Robert Downs and Shaunna Morrison (7), Jack Farmer (8), John Grotzinger and Edward Stolper (9), Douglas Ming, Richard Morris, and Elizabeth Rampe (10), Allan Treiman (11), Philippe Sarrazin (12), and The MSL Science Team (4)

(1) Planetary Science Institute, Tucson, AZ, United States (dvaniman@psi.edu), (2) NASA Ames, Moffett field, CA, United States, (3) ESCG\Hamilton Sundstrand, Houston, TX, United States, (4) Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, United States, (5) Indiana University, IN, United States, (6) Chesapeake Energy, OK, United States, (7) University of Arizona, Tucson, AZ, United States, (8) Arizona State University, Phoenix, AZ, United States, (9) California Institute of Technology, Pasadena, CA, United States, (10) NASA Johnson Space Center, Houston, TX, United States, (11) Lunar and Planetary Institute, Houston, TX United States, (12) inXitu, Campbell, CA, United States

The CheMin instrument on the Mars Science Laboratory (MSL) rover Curiosity uses a Co tube source and a CCD detector to acquire mineralogy from diffracted primary X-rays and chemical information from fluoresced X-rays. CheMin has been operating at the MSL Gale Crater field site since August 5, 2012 and has provided the first X-ray diffraction (XRD) analyses in situ on a body beyond Earth. Data from the first sample collected, the Rocknest eolian soil, identify a basaltic mineral suite, predominantly plagioclase (\sim An50), forsteritic olivine (\sim Fo58), augite and pigeonite, consistent with expectation that detrital grains on Mars would reflect widespread basaltic sources. Minor phases (each <2 wt% of the crystalline component) include sanidine, magnetite, quartz, anhydrite, hematite and ilmenite. Significantly, about a third of the sample is amorphous or poorly ordered in XRD. This amorphous component is attested to by a broad rise in background centered at $\sim 27^\circ 2\theta$ (Co $K\alpha$) and may include volcanic glass, impact glass, and poorly crystalline phases including iron oxyhydroxides; a rise at lower 2θ may indicate allophane or hisingerite. Constraints from phase chemistry of the crystalline components, compared with a Rocknest bulk composition from the APXS instrument on Curiosity, indicate that in sum the amorphous or poorly crystalline components are relatively Si, Al, Mg-poor and enriched in Ti, Cr, Fe, K, P, S, and Cl. All of the identified crystalline phases are volatile-free; H₂O, SO₂ and CO₂ volatile releases from a split of this sample analyzed by the SAM instrument on Curiosity are associated with the amorphous or poorly ordered materials. The Rocknest eolian soil may be a mixture of local detritus, mostly crystalline, with a regional or global set of dominantly amorphous or poorly ordered components.

The Rocknest sample was targeted by MSL for “first time analysis” to demonstrate that a loose deposit could be scooped, sieved to $<150 \mu\text{m}$, and delivered to instruments in the body of the rover. A drilled sample of sediment in outcrop is anticipated. At the time of writing this abstract, promising outcrops are in range and this talk will provide an update on data collected with the CheMin instrument.