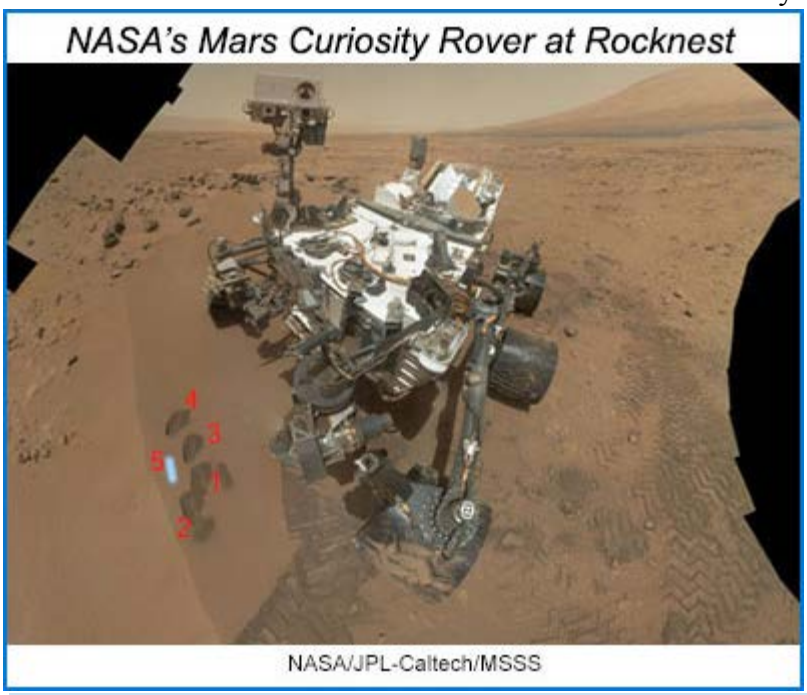
PLANETARY SCIENCE RESEARCH DISCOVERIES
CosmoSparks
Quick Views of Big Advances

Composition of the Rocknest Deposit, Gale Crater, Mars

The detailed chemistry and mineralogy of a dusty, silty sand deposit at a location on Mars named Rocknest are reported in associated papers as part of a five-article series in the 27 September 2013 issue of *Science* that focuses on the initial results of Curiosity rover's explorations at Gale Crater.



Using the rover's Alpha-Particle X-ray Spectrometer (APXS) and the CheMin powder X-ray diffraction instrument, first authors David Blake (NASA Ames Research Center) and David Bish (Indiana Univeristy) and coauthors describe the samples collected from this accumulation of wind-blown particles, also known as the Rocknest sand shadow.

This self-portrait of Curiosity rover at the Rocknest sand shadow was created by mosaicing 55 MAHLI (Mars Hand Lens Imager) images from ***sol*** 84 of the mission. Dark scoop marks (numbered) are visible in the lower left corner of the image. Samples collected from the trenches were sieved to less than 150µm-size, with scoops 1 and 2 used to clean the sample handling and processing system. Samples from scoops 3, 4, and 5 were processed by the onboard instruments. The image is annotated with a blue mark to show the location of scoop 5, which was collected on a later sol.

The Rocknest sand shadow is similar in appearance and composition to other wind-blown deposits at other locations on Mars; we know this from previous lander and orbital missions. Composed of crystalline and X-ray-amorphous material, the researchers compared the Rocknest <150-µm-size-fraction data to global ***regolith*** measurements obtained from Mars Exploration Rovers and from laboratory analyses of basaltic Martian meteorites. Specific meteorites used for comparison are: Shergotty, NWA 6234, EETA 79001A, and QUE 94210. The researchers estimate the Rocknest sand shadow is ~71% crystalline basaltic material and ~29% X-ray amorphous solids based on CheMin data. When they incorporate APXS and meteorite data with the CheMin data, their estimates change to ~55% crystalline basatic material and ~45% X-ray-amorphous solids. The crystalline materials are dominated by igneous minerals: plagioclase, olivine, augite, and pigeonite. Bish and coauthors report the data are consistent with near-surface crystallization of basaltic lavas, similar to basalts found elsewhere on Mars and some Martian basaltic meteorites. Importantly, they detected no hydrated crystalline phase (e.g. clay minerals), which implies that ***volatiles***, including water, are only associated (or bound) with the iron-rich and silicon-poor X-ray-amorphous materials. This is consistent with results from the rover's Sample Analysis at Mars (SAM) instrument as reported by Laurie Leshin (Rensselaer Polytechnic Institute) and coauthors, who estimate 3 to 6 wt % H_2O concentration in the Rocknest amorphous material. Combining the

chemical and mineralogical data obtained at Rocknest with analyses of surface deposits at other locations on Mars helps researchers evaluate the contributions of local, regional, and global rock compositions at each site and/or the mixing processes that have brought the materials together. Coupled with laboratory data on Martian meteorites, the rover analyses give a much fuller picture of the geological and geochemical evolution of the Martian surface.

See References:

· Bish, D. L., and 19 others (2013) X-ray Diffraction Results from Mars Science Laboratory: Mineralogy of Rocknest at Gale Crater, *Science,* v. 341, doi:10.1126/science.1238932 [***abstract***].
· Blake, D. F. and 45 others (2013) Curiosity at Gale Crater, Mars: Characterization and Analysis of the Rocknest Sand Shadow, *Science,* v. 341, doi:10.1126/science.1239505 [***abstract***].
· Leshin, L. A. and 34 others (2013) Volatile, Isotope, and Organic Analysis of Martian Fines with the Mars Curiosity Rover, *Science,* v. 341, doi:10.1126/science.1238937 [***abstract***].

See also:

· ***Spectrometers*** on Mars Science Laboratory Curiosity Rover.
· ***Instruments*** described in detail at the MSL Science Corner.

Related **PSRD** articles:

· ***LIBS: Remote Analysis of Elemental Compositions***.
· ***Mineral Abundances in Martian Soils***.

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