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Lunar Water Resource Demonstration (LWRD) Test Results

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NASA has undertaken the In-Situ Resource Utilization (ISRU) project called RESOLVE (Regolith and Environment Science & Oxygen and Lunar Volatile Extraction). This project is an Earth-based lunar precursor demonstration of a system that could be sent to explore permanently shadowed polar lunar craters, where it would drill into regolith, quantify the volatiles that are present, and extract oxygen by hydrogen reduction of iron oxides. The RESOLVE chemical processing system was mounted within the CMU rover "Scarab" and successfully demonstrated on Hawaii's Mauna Kea volcano in November 2008. This technology could be used on Mars as well.

As described at the 2008 Mars Society Convention, the Lunar Water Resource Demonstration (LWRD) supports the objectives of the RESOLVE project by capturing and quantifying water and hydrogen released by regolith upon heating. Field test results for the quantification of water using LWRD showed that the volcanic ash (tephra) samples contained 0.15-0.41% water, in agreement with GC water measurements. Reduction of the RH in the surge tank to near zero during recirculation show that the water is captured by the water beds as desired. The water can be recovered by heating the Water Beds to 230°C or higher.

Test results for the capture and quantification of pure hydrogen have shown that over 90% of the hydrogen can be captured and 98% of the absorbed hydrogen can be recovered upon heating the hydride to 400°C and desorbing the hydrogen several times into the evacuated surge tank. Thus, the essential requirement of capturing hydrogen and recovering it has been demonstrated.