School of Ocean & Earth Science & Technology

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Note: This corresponds to Planetary Missions, Instruments, and Data Analysis Techniques Posters session P41B-0412.

A new LASER instrument for in-situ measurements on Mars

San Francisco – Scientists at the School of Ocean and Earth Science and Technology have proposed a LASER instrument that could measure in-situ rock age and geochemistry on Mars. The laser desorption (LD) resonance ionization (RI) mass spectrometer (MS) would be capable of measuring the geochemical and isotopic composition of surface rocks to provide insight into the formation and evolution of the Martian crust and mantle.

The prototype instrument (called LDRIMS) will use a new type of multi-bounce time of flight mass spectrometer integrated with existing lasers to collect both rubidium-strontium (Rb-Sr) and neodymium-samarium (Nd-Sm) isotopic ages. The instrument uses the laser to produce the atoms required for dating, and then sends those atoms to the mass spectrometer to measure the resulting isotopes.

The instrument will have two different operating modes, “RI” and “LD”. The “RI” mode can be used to selectively ionize and precisely measure the abundance of Rb-Sr isotopes to obtain igneous rock ages within < ±250 Ma. The “LD” mode can collect all desorbed ions, thereby providing high precision (part per thousand or better) elemental measurements of the composition of the surface.

Other important features of this instrument include its small mass (<10 kg in weight), low power consumption (< 50 Watts of power), and small size (it will fit into a box the size of two desk drawers).

"This instrument could be used for Mars or the Moon or any solid surface planetary body in the Solar System," says Scott Anderson, Principal Investigator of this study. "It is important because we will be able to do the geochemistry really well, but also obtain a date from the surface using multiple geochronometers with minimal sample handling".

The proposed LDRIMS could be used on the 2009 Mars Science Laboratory (MSL), Scout and landed missions, and for any rocky body in the solar system, and hence is important for the Discovery and New Frontier Programs.

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P41B-0412 A LASER RIMS Instrument to Date Igneous Rocks, Measure Geochemistry, \& Characterize Alteration in-situ on Mars *F S Anderson, T Whitaker, G Miller, D Young, J Mahoney, J Taylor POSTER

The Surface Composition of Mars: An Integrated Picture From Orbital, Telescopic, and in Situ Observations I Posters
P21B-0054 Gray Hematite Distribution within Valles Marineris *C Weitz, M Lane, F S Anderson POSTER