Geophysical Research Abstracts
Vol. 18, EGU2016-14753, 2016
EGU General Assembly 2016

Raman spectra of Martian glass analogues: a tool to approximate their chemical composition

Danilo Di Genova (1), Stephan Kolzenburg (2), Alessandro Vona (3), Magdalena O. Chevrel (4), Kai-Uwe Hess (1), Daniel R. Neuville (5), Werner Ertel-Ingrisch (1), Claudia Romano (3), and Donald B. Dingwell (1)

(1) Ludwig-Maximilians-Universität - München, LMU, Dept. Earth and Environmental Sciences, Munich, Germany (danilo.digenova@min.uni-muenchen.de), (2) Dipartimento di scienze della terra, Univertsità degli studi di Torino, Via Valperga Caluso 35, 10125 Torino, Italy, (3) Dipartimento di Scienze, Università degli Studi Roma Tre, L.go San Leonardo Murialdo 1, 00146 Roma, Italy, (4) Departamento de Vulcanología, Instituto de Geofísica, Universidad Nacional Autónoma de México, 04510, México D.F., Mexico, (5) Géomatériaux, CNRS-IPGP UMR 7154, Paris Sorbonne Cité, 1 rue Jussieu, 75005 Paris, France

We present a study on the systematic changes of Raman spectra of a series of glasses as a function of their chemistry. These glass compositions are considered as analogues for rock materials identified on Mars. We performed a diffusion experiment between an iron-rich basaltic and a rhyolitic melt under reducing conditions to produce a wide range of intermediate chemical compositions.
We then systematically acquired Raman spectra of the intermediate composition glasses across the diffusion interface and correlate them with the corresponding chemical compositions derived by electron microprobe analysis.
Using a linear mixing model for the spectral evolution as a function of chemistry, we fitted a Raman parameter to each spectrum to estimate the chemical composition of each glass. The Raman model was verified using external natural and synthetic samples.
This study: 1) expands the Raman database of silicate glasses including alkali and iron-rich compositions as expected to be found on Mars; and 2) contributes to develop Raman spectroscopy as a quantitative tool in geological and planetary science to estimate the chemistry of glasses on a microscopic level.
Moreover, as Raman spectrometers have been developed for two forthcoming Mars missions [ExoMars program (2016-2018) and Mars 2020], with the benefit of this calibration, Raman spectroscopy will allow rapid, in-situ and remotely controlled identification and investigation of silicate glasses on future extraterrestrial rover missions.