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Mössbauer and VNIR Study of Dust Generated From Olivine Basalt: Application to Mars

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Mössbauer spectroscopy of surface rocks, soil, and dust on Mars from the Mars Exploration Rovers (MER) suggests that the mineral olivine is widespread on the surface. Detection of the mineral by near-IR optical spectroscopy from Martian orbit indicates that it is found in relatively small isolated outcrops concentrated in the floors and rims of craters distributed around the ancient cratered highlands of Mars. To shed light on this apparent paradox, we have performed a detailed Mössbauer and visible-near-IR (VNIR) investigation of dust generated from Icelandic olivine basalt, which is a good Mössbauer analogue to the igneous rocks at Gusev crater on Mars. The results show that the amount of olivine relative to pyroxene can be underestimated by almost an order of a magnitude in VNIR reflectance spectra, most probably because of the longer effective optical path length in pyroxene compared to olivine.