

EXPERIMENTAL STUDY OF WATER-ROCK INTERACTIONS ON MARS

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Some Martian meteorites show evidence of having reacted with aqueous fluids while still on the surface of Mars. Preliminary experiments indicate that aqueous alteration of glassy basalts begins to produce distinctive mineral assemblages on timescales of only days. These mineral assemblages are characteristic of the conditions under which the rocks were altered. Initial experimental results suggest constraints for the conditions under which Martian meteorites including ALH84001, EETA79001, Nakhla and Lafayette underwent alteration at or near the surface of Mars. The experimental data suggest that none of these meteorites underwent long-term or high-temperature interaction with aqueous fluids, in agreement with independent studies of the alteration mineral assemblages. These results support alteration models which invoke short-term or intermittent wetting of rocks rather than extensive hydrothermal alteration. Ongoing experiments are examining alteration of a wider range of mafic rock compositions which are more representative of rock compositions on Mars. These experiments are intended to more accurately delineate the conditions under which different Martian meteorites were altered. Because many of these meteorites are igneous rocks which formed 1.3 billion years ago, the results of this study will provide insight into conditions in the Martian crust in the last billion years.