

Characterization of manganese oxide mineralogy in rock varnish and dendrites using X-ray absorption spectroscopy

DAVID A. MCKEOWN^{1,*} AND JEFFREY E. POST^{2,*}

¹Vitreous State Laboratory, The Catholic University of America, 620 Michigan Avenue N.E., Washington, D.C. 20064, U.S.A.

²Department of Mineral Sciences, Smithsonian Institution, Washington, D.C. 20560-0119, U.S.A.

ABSTRACT

X-ray absorption data were collected for a series of varnish and dendrite Mn oxide coatings on rock substrates containing a wide variety of mineralogies exposed to a variety of environments. Near-edge spectra of the coatings indicate that the Mn-oxide phases present have Mn valences between 3+ and 4+, with average Mn valences for the varnishes closer to 4+ than those for the dendrites. Mn EXAFS data and analyses indicate that Mn-oxide structure types for the varnishes range, perhaps continuously, from large tunnel phases, similar to todorokite and romanechite, to layer phases, i.e., birnessite-family. Similar results were found for the dendrite samples, except that the variety of Mn-oxide phases is somewhat larger than those found for the varnishes. No correlations were found between Mn-oxide structure-type within these coatings and the corresponding substrate petrology.