OBSERVATION AND ANALYSIS OF MARTIAN METEORITE Y000593: EVIDENCE OF BIOSIGNATURES

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Introduction: Yamato000593 is a meteorite discovered in Antarctica by JARE in 2000 and identified as a Martian nakhlite [1,2]. Previously, Fisk et al. [5] suggested tunnels and galleries, along with secondary clay and carbonate phases, discovered in both oceanic basalts and the Nakhla meteorite are likely the result of biogenic activity. Here we report the first in-depth analysis of secondary alteration features in Y000593 suggesting the presence of carbonate phases and pre-terrestrial iddingsite clay associated with tunnels and galleries similar to those previously studied in Nakhla and oceanic basalts. No evidence of terrestrial contamination has yet been found in Y000593. It is known that the iddingsite in Nakhla formed under low-temperature, aqueous weathering conditions [3]; consequently, the presence of this mineral as well as carbonate in Y000593 may be further evidence supporting a past history of warmer and wetter climate on Mars [4].

Results: Optical and FE-SEM analysis of a polished thin section revealed iddingsite-filled impact microfractures. Within grains of olivine and veins of high-silica glass we document 1-4 μm tunnels and galleries which extend outward from fractures and which are quite similar to those in Nakhla [3-5]. EDX analyses of these alteration features also reveal carbonate phases with high Mn and Ca abundances. Iddingsite and carbonate phases are both closely associated with the tunnel and gallery features.

Discussion: Alteration in Y000593 appears similar in size and distribution to tunnels and galleries previously observed in Nakhla as well as oceanic basalts containing live DNA [5]. EDX compositions of alteration products in both Martian meteorites are consistent with phases observed in oceanic basalts and attributed to biotic weathering.

References: [1] Meyer C. 2003. *Mars Meteorite Compendium*, XXII-1-XXII-5. [2] Imae N. (2002) *Lunar and Planetary Science*, XXXIII, 1-2 [3] Gooding et al. (1991) *Meteoritics* 26, 135-143. [4] Wentworth et al. (2005) *Icarus* 174, 382-395 [5] Fisk et al. (2006) *Astrobiology* 6, 48-68.