

Please ensure that your abstract fits into one column on one page and complies with the *Instructions to Authors* available from the Abstract Submission web page.

Ceres Revealed in a Grain of Salt

M.E. ZOLENSKY^{1*}, R.J. BODNAR², M. FRIES¹, Q.H.-S. CHAN¹, Y. KEBUKAWA³, T. MIKOUCHI⁴, K. HAGIYA⁵, M. KOMATSU⁶, K. OHSUMI⁷, A. STEELE⁸

¹ARES, NASA JSC, Houston, TX 77058, USA

(*correspondence: michael.e.zolensky@nasa.gov)

²Virginia Tech, Blacksburg, VA, 24061, USA

³Yokohama National University, Yokohama, Japan;

⁴University of Tokyo, Hongo, Tokyo 113-0033, Japan

⁵Graduate School of Life Sci., Hyogo University, Japan

⁶SOKENDAI, Grad. Univ. for Advanced Studies,

Japan

⁷JASRI, Hyogo 679-5198, Japan

⁸Carnegie Geophysical Lab, Washington, DC, USA

Introduction

Zag and Monahans (1998) are H chondrite regolith breccias containing 4.5 GY old halite crystals which contain abundant inclusions of aqueous fluids, solids and organics [1-5]. These all originated on a cryovolcanically-active C class asteroid, probably 1 Ceres [3, 4]; the halite was transported to the regolith of the H chondrite parent asteroid, potentially 6 Hebe. Detailed analysis of these solids will thus potentially reveal the mineralogy of Ceres.

Mineralogy of Solids in the Monahans Halite

Solid grains are present in the halites, which were entrained within the mother brines during eruption, including material from the interior and surface of the erupting body. The solids include abundant, widely variable organics [6] that could not have been significantly heated (which would have resulted in the loss of fluids from the halite). Our analyses by Raman microprobe, SEM/EDX, synchrotron X-ray diffraction, UPLC-FD/QToF-MS, C-XANES and TEM reveal that these trapped grains include macromolecular carbon (MMC) similar in structure to CV3 chondrite matrix carbon, aliphatic carbon compounds, olivine (Fo99-59), high- and low-Ca pyroxene, feldspars, phyllosilicates, magnetite, sulfides, metal, lepidocrocite, carbonates, diamond, apatite and zeolites.

Conclusions

The halite in Monahans and Zag derive from a water and carbon-rich object that was cryovolcanically active in the early solar system, probably Ceres [3]. The Dawn spacecraft found that Ceres includes C chondrite materials. Our samples include both protolith and aqueously-altered samples of the body, permitting understanding of alteration conditions. Whatever the halite parent body, it was rich in a wide variety of organics and warm, liquid water at the solar system's dawn.

References: [1] Zolensky et al. (1999) *Science* **285**, 1377-9; [2] Rubin et al. (2002) *MAPS* **37**, 125-142; [3] Fries

**This abstract is too long to be accepted for publication.
Please revise it so that it fits into the column on one
page.**

et al. (2013) *MAPS* **48**, A80; [4] Zolensky et al. (2013) *MAPS*
48, A394; [5] Zolensky et al. (2003) *66th MetSoc Meeting*;
[6] Fries et al. (2011) *MAPS* **46**, A70.