HALOGEN-SUBSTITUTED METHANE IN MONAHANS HALITE.

Marc D. Fries[1], Andrew Steele[2] and Michael Zolensky[3]. [1]Planetary Science Institute, Tucson, AZ [2]Carnegie Institution of Washington, Washington, DC [3]NASA Johnson Space Center, Houston, TX. E-mail: fries@psi.edu.

Introduction: We report the discovery of partially halogen-substituted methane dissolved in ancient halite from the Monahans meteorite. Raman spectroscopic imaging reveals the relatively abundant presence of this light organic compound in proximity to carbonaceous inclusions within the halite. Evidence suggests that the methane exsolved from the carbonaceous inclusions originating on the halite parent body (HPB). This marks the first discovery of methane within a meteorite, and it provides important information about the composition of the parent body from which the halite originated.

Discussion: Halites found in the Monahans H5 chondrite have been found to contain brine inclusions [1]. Previous work using Raman spectroscopy has revealed the presence of silicate, carbonaceous and other grains embedded within the halite [2,3]. The identity and composition of these grains reveal that they are not consistent with those of the H chondrite Monahans meteorite. This fact, and the seamless incorporation of the brine-bearing halite with the anhydrous H chondrite matrix indicate that the halite does not originate from the H chondrite parent body, but instead the halite was gently transported to and incorporated into the H chondrite body [2,3]. Given that the halite contains fragile, native brine inclusions, it is proposed that the ancient halite was transported via an active geyser or geysers on the HPB as this is the only mechanism gentle enough to affect the transfer without disrupting the brine inclusions. The exact identity of the HPB remains unknown at this time, but it must have been large enough to produce active geysers while accretion was still a very active process in the young asteroid belt. Also, the HPB must have been relatively local to the Monahans parent body, as dynamical considerations limit the infall velocity permitted to retain the brine inclusions. A large, carbonaceous, asteroid belt body such as Ceres is a viable option for the HPB. The presence of methane makes the halite a unique and highly scientifically valuable sample, with the possibility that it constitutes samples of a young Ceres or a similar body. The possibility also exists that young carbonaceous bodies were richer in light organics prior to parent body alteration than meteorite samples indicate. Also, the halite delivery scenario implies that light organics necessary for early prebiotic chemistry were delivered to inner Solar System bodies, to include the Earth, via halite transfer.

References: [1] Zolensky *et al Science* **285** (1999) 1377-1379. [2] Fries M., Zolensky M., Steele A., 74th MetSoc (2011) Abstract #5390. [3] Zolensky M., Fries M., Steele A., Bodnar R., Life Detection in Extraterrestrial Samples meeting (2012) Abstract #6024.