**MICROCRACK POROSITY IN BEAVER CREEK AND MENOW, HIGH POROSITY ORDINARY CHONDRITES.**

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**Introduction:** Porosity of meteorites gives us insight into the origin and evolution of the fabric of materials in the Solar System. We have been evaluating meteorite porosity for a number of years using both helium pycnometry [1] and a computerized point-counting system [2]. Most ordinary chondrites fall into a surprisingly narrow range of porosity values. And both measurement methods give comparable values for the porosity of ordinary chondrites, with the bulk of the porosity apparently in the microcracks that are visible using SEM imaging as well as accessible to the He for the pycnometry measurements.

By contrast, carbonaceous chondrites exhibit a major discrepancy between the results generated by the two methods [2, 3]. Pycnometry values for the carbonaceous chondrites are as much as an order of magnitude larger than those made by point-counting or using fluids like water or carbon tetrachloride to determine bulk and grain volumes. Even when adjusting for visible holes and cracks in the fabric of the thin section, which might be attributed to thin section preparation effects, the porosity measurements do not agree. The visual appearance of the sample in the SEM is very compact with minimal microcracking and these images do not reveal where the porosity measured with pycnometry is located.

**Two Exceptional Ordinary Chondrites:** In this study we look at two H4 ordinary chondrites that appear to have high porosity, Beaver Creek (shock level S3) and Menow (shock level S1). Using pycnometry and beads, the porosity of Beaver Creek is 15.3% ± 2.2% [4]; the measured porosity of Menow is 13.2% ± 2.6% [4] but when corrected for weathering, Menow's model porosity is 18.6% ± 0.8% [1]. In a visual examination of their thin sections, there is a fair amount of porosity in the form of holes and cracks in the fabric in both samples. The porosity measured with point-counting of the SEM images is 11.8% (3.7% to 25.7%) for Beaver Creek and 6.9% (2.7% to 14.6%) for Menow. Both these measurements are within the normal range observed in the ordinary chondrites. The discrepancy between hand sample and point counting porosities is less extreme than that observed for carbonaceous chondrites, but nonetheless points to the presence of porosity in meteoritic materials that is accessible to He, but not visually observable at the scale we are using to image these samples. It may be a sampling bias in the case of the images chosen for the point-counting, but may also be due to the same problems observed in the carbonaceous chondrites.

**Discussion:** We had found [1] that the porosity of low shock (S1 and S2) meteorites can range from typical (5-10%) ordinary chondrite values, to more than 20% porosity, approaching the range of some carbonaceous chondrites. Menow represents this group of meteorites. Beaver Creek, at shock S3, is a unique high porosity outlier for moderate shock ordinary chondrites. For carbonaceous chondrites, it is argued [2] that the high porosity seen is at a scale too large to be visible in thin section, and due to incomplete compaction and lithification. This may also be true here, but further work is necessary to confirm the location of the porosity that is not visually observed.

**References:** [1] Consolmagno G. J. et al. 2008. *Chemie der Erde* 68:1–29. [2] Strait M. M. and Consolmagno G. J. (2002). *Meteoritics & Planetary Science* 37:A137. [3] Consolmagno G. J. et al. 2008, this volume. [4] Wilkison S. L. et al., 2003. *Meteoritics & Planetary Science* 38:1533–1546.