AQUEOUS ALTERATION OF AN ORDINARY CHONDRITE FOR COLLISIONAL STUDIES.

M. M. Strait[1] , A. N. Clayton[1], S. J. Jack[1], G. J. Flynn[2] and D. D. Durda[3]. [1]Dept. of Chemistry, Alma College, Alma, MI, USA. E-mail: straitm@alma.edu. [2]Dept. Of Physics, State University of New York-Plattsburgh, Plattsburgh NY USA, [3]Southwest Research Institute, Boulder CO, USA.

Introduction: The disruption pattern of materials during a catastrophic event is dependent upon the nature of the material being disrupted [1]. It has been found that terrestrial materials have a different size distribution of particles than meteorites and that within meteorites, ordinary chondrites are different from carbonaceous chondrites [2]. More studies of the disruption of carbonaceous chondrites are needed, but because of the rare and precious nature of some of these meteorites, samples are not readily available for disruption. This lab has been attempting to create an analog by hydrating an ordinary chondrite [3] and then disrupting the resulting material.

Experimental: Samples of NWA 869 are crushed to less than 2 mm and seive-sorted into 8 size fractions ranging from <0.063 mm to >4 mm. These particles are placed in a pressure bomb at pH ~13 and heated at 150^{o}C for 30 to 70 days [3]. The sample is then placed in a 4 cm diameter pipe at a depth of 1 to 4 cm and compressed in a hydraulic press for 5 to 45 days at approximately 5 tons of pressure. The sample is removed from the pipe and disrupted at the NASA Ames Vertical Gun Range using 1/8” Al projectiles at velocities of 4 to 5.5 km/s. The fragments produced are again size-sorted into the same 8 fractions [4]. As a control, a crushed sample of NWA 869 that had not been hydrated was compressed. The resulting sample fell apart with minimal disturbance, showing there is a change in the nature of the material after the hydration process.

Discussion: Early indications show both that the sample has hydrated to some extent and that the artificial sample is disrupting in a different pattern from the material used to create the sample [5]. Infrared spectroscopy used to characterize the hydration, shows the appearance of the characteristic water peak at ~3500 cm^{-1} as well as changes in the fingerprint region between 1000 and 400 cm^{-1} characteristic of the shift from olivine to clay. The sample produced in this work had a three-dimensional shape more like a rock, rather than the flat disk used earlier, and showed the more characteristic disruption pattern as seen in true rocks. The size distribution showed a change between the particles before hydration and compression and after disruption. The original particles were crushed to less than 2 mm, but after the disruption more than 35% of the mass was in fragments larger than 2 mm, with ~15% of the mass >4 mm in diameter. The size-frequency distribution of the particles produced shows a pattern similar to that seen for Murchison [2] in earlier studies. These indications show that the artificially hydrated samples can be used to model impacts of these materials. More of these larger samples are being prepared and will be disrupted in future runs at the AGVR.

References: [1] Durda D. D. and Flynn G. J. 1999. *Icarus* 142:46-55. [2] Flynn G. J. et al. 2009. *Planetary and Space Science, 57,* 119-126. [3] Strait, M. M. et al. 2012. *Meteoritics & Planetary Science* 75:5363S. [4] Clayton, A. N. et al. 2013. 44th Lunar and Planetary Science Conference. Abstract #2730. [5] Clayton, A. N. et al. 2014. 45th Lunar and Planetary Science Conference. Abstract #2799.