

Comparison of Compression Strength of Hydrated Meteorites. C. L. Loftus¹, B. A. May¹, M. J. Molesky¹, M. M. Strait¹, G. J. Flynn² and D. D. Durda³. ¹Dept. of Chemistry, Alma College, Alma MI 48801, ²SUNY-Plattsburgh, Plattsburgh NY 12901, ³Southwest Research Institute, Boulder CO 80302

Introduction: The study of meteorites is important in the understanding of our universe and interactions between objects in space. Meteorites can be used as analogues of asteroids for impact studies because asteroids are the parent bodies of meteorites and will therefore act in a similar way during impact and disruption [1]. Knowing the compression strength of a meteorite can help determine how its parent body will react upon impact and how much force it would take to disrupt it.

CI Carbonaceous Chondrites are among the rarest of meteorites found on Earth and have a unique content of organic compounds, amino acids, and clays from hydration on their parent body [2]. Not much physical data has been collected on these specific meteorites [2], and due to the nature of our experiments, we have not been able to obtain a CI Carbonaceous Chondrite to study. In order to justify the need and seriousness of data collection on a CI Carbonaceous Chondrite for this project, artificial analogs are being made. By testing these analogs, it is possible to make assumptions as to the compression strength and relationships between various properties of CI Carbonaceous Chondrites without possession of one.

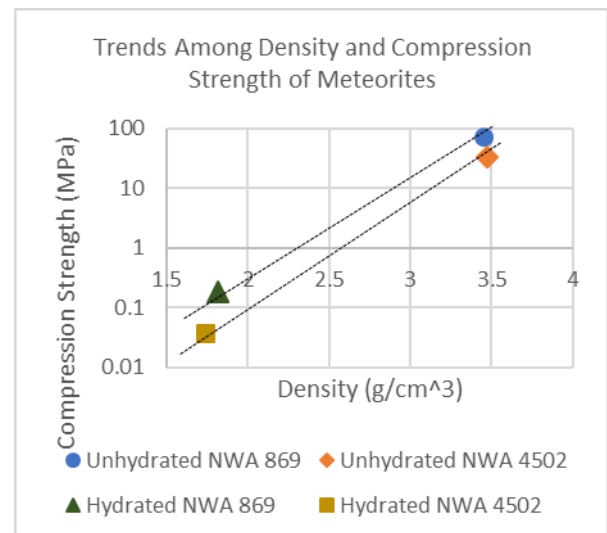
Previous Work: The first artificial meteorites were made from Northwest Africa 869 (NWA 869) samples. NWA 869, an L3-6 ordinary chondrite, was chosen because it is an abundant meteorite. Samples were hydrated using 0.5 M NaOH [3]. Though it created the desired texture, the samples were missing the carbon that is found in CI Carbonaceous Chondrites. In the next attempt, samples of Northwest Africa 4502 (NWA 4502), a CV3 carbonaceous chondrite, were hydrated. These samples better represented the goal of mimicking Orgueil, a CI Carbonaceous Chondrite with a density of 1.6 g/cm³ [2].

Current Work: This work focused on comparing the physical properties, including compression strength, of NWA 4502 with the artificially hydrated NWA 4502 samples. NWA 869 and artificially hydrated NWA 869 samples were also tested for comparison.

Testing: Compression strength is one of the most common methods used for testing the strength properties of rock or rock-like materials, including meteorites [4]. Samples are cut into cubes and put under pressure until failure. The method of choice was to apply weights in 50 g increments to the samples, but this did not apply enough pressure on the unhydrated samples;

therefore, a hydraulic press was used for testing the unhydrated samples.

Results and Discussion: Hydrated NWA 4502 had lower compression strength than all the samples tested. Both hydrated samples had lower compression strengths than their unhydrated partners. When the compression strength of each meteorite is compared with its density, it becomes clear that the weaker samples had the lower densities. With this information, we will move forward by continuing to test compression strength of different types of meteorites to see if this observed relationship between compression strength and density continues.



References: [1] Flynn G. J. et al. (2005) *Earth, Moon, and Planets*, 213-231. [2] Ehrenfreund P. et al. (2000) *PNAS*, 2138-2141. [3] Jones, C.L. and Brearley, A. (2006) *Geochim. Cosmochim. Acta*, 70,1040-1058. [4] Thuro, K., et al. (2001) *ISRM Regional Symposium*, 169-174.

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