Comparison of Compression Strength of Ordinary and Carbonaceous Chondrite Simulants

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Asteroid impact studies allow us to gain a greater understanding of our solar system and the interactions within it. There is currently not a lot of data on the physical properties of meteorites and this data is essential to understanding our solar system, including impacts within it. Compression strength is a common method used to test the physical properties of rock or rock-like materials. Wet carbonaceous chondrites do not often fall to Earth, which makes them rare and hard to obtain for our studies. Using carbonaceous chondrite meteorite simulants (hydrated Northwest Africa 4502 and hydrated Northwest Africa 869) created in our lab, as well as a commercially produced material (Exolith CC), allows us to make first order approximations of the compression strength of these materials. A series of experiments were performed to test the compression strength of Exolith CC, hydrated NWA 4502, and hydrated NWA 869 samples. Each sample was created in our lab using previously established hydration methods. After the hydration process is complete, the sample is placed into a 2 cm cube mold and put on a hot plate overnight. The sample comes out of the mold as a firm cube and the dimensions and mass of the sample are measured. Testing is performed using a bottle that is secured on top of the sample and incrementally filled with water until it fails. The amount of water and the bottle are then weighed in order to find the weight needed to crush the sample. We found that the compression strength of the non-hydrated NWA 4502 and 869 was stronger than the hydrated NWA 4502 samples. These samples did indeed have a very different compression strength, and this is due to the structure of each sample. While the values were close to one another, the Exolith CC sample is stronger than the hydrated NWA 869 and NWA 4502 samples. An understanding of these physical properties of various types of meteorites, like wet carbonaceous chondrites, can be applied to larger scale solar system processes.