DISRUPTION EXPERIMENTS ON HYDROUS METEORITES

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The outer half of the main-belt is dominated by asteroids that are classified as C-, P-, or D-type, based on their reflection spectra. These low-albedo asteroids are believed to be the parent bodies of the carbonaceous chondrite meteorites. A significant fraction of the carbonaceous chondrite meteorites are hydrated, and some of the C-, P-, and D-type asteroids show evidence for hydration in their reflection spectra. Thus, a significant fraction of the targets for cratering and collisional disruption in the outer half of the main-belt are likely to be hydrated bodies. Nonetheless, most disruption experiments on natural rock targets have concentrated on anhydrous rocks, such as basalts. To begin to recitify this situation, we have undertaken a series of impact experiments on hydrous meteorites – the Murchison CM2 chondrite and three other CM2s collected in the Antarctic. We disrupted a 30.09 gram elongated whole stone of the Murchison CM2 meteorite using a 1/8th inch diameter Al-sphere fired at 4.45 km/sec using the NASA Ames Vertical Gun Range (AVGR). Six passive detectors, each containing two 7 micron and two 13 micron thick Al-foils, a single 51 micron thick Al-foil, and two aerogel capture cells were deployed in the AVGR chamber to record/capture debris from the disruption. We measured the mass frequency disruption of the fragments produced by the Murchison disruption by combining the data from the foil penetrations with the data from the fragments recovered from the floor of the AVGR. This cumulative mass-frequency distribution of fragments from the Murchison shot is reasonably well fit by a single power-law over the range from 10-6 grams to the largest fragment, however it is almost flat for masses smaller than 10-6 grams. Compared to Allende and the ordinary chondrites we disrupted previously, this Murchison disruption produced an overabundance of dust ¿10-5 grams, but an underabundance of dust ¡10-6 grams. Preliminary results suggest that Murchison and the three Antarctic CM2s have similar "strength," i.e., produce a similar ratio of largest fragment to target mass for a given specific impact energy, to that of the anhydrous meteorites we previously disrupted.