

PETROLOGICAL AND Ar-Ar STUDIES OF SHOCKED CHONDRITES. T. D. Swindle¹, D. A. Kring¹, J. Bond¹, E. Olson¹, and C. Jones². ¹Lunar and Planetary Lab, U. of Arizona, Tucson AZ. E-mail: tswindle@u.arizona.edu. ²U. of Pennsylvania, Philadelphia PA.

Although impact cratering and collisional disruption are the dominant geologic processes affecting asteroids, very little is really known about them. We began studying these processes with the Cat Mountain L5 impact melt breccia [1] and have continued with an investigation of the H chondrites Portales Valley [2], Ourique [3], and Orvinio [4]. Although a number of shocked L chondrites have been studied, shocked LL and H chondrites are less common, so studies of them have been less common as well. Based on limited data, [5] suggested the "lunar cataclysm" bombardment occurred over a much more extended period of time in the asteroid belt (until perhaps 3.4 Ga) than in the Earth-Moon system (~3.85 Ga). It is clear that more meteorite impact melts need to be studied and their ages determined to see if they really do record an event beginning ~4 Ga and, if so, how long it lasted. In addition, we would like to see if there are identifiable events in multiple samples from the H and LL parent bodies, equivalent to the well-known ~500 Ma event for L chondrites. Finally, even within the well-studied L chondrites, we would like to search for further hints of the 800-900 Ma event that appears to be present within some of the meteorites [1], and compare meteorite with ages of roughly 500 Ma with the more detailed age for this event apparently given by Swedish fossil meteorites [6].

Hence, we are studying of shocked chondrites, combining petrological analyses with Ar-Ar dating. Petrological analyses are made to verify that the melts are produced by bulk melting host lithologies and determining the extent to which metallic, sulfide, and silicate-oxide components have been redistributed by shock. Silicate and metallic textures and compositions are used to determine the cooling rates of the melts, which can, in turn, help constrain the size of the impact cratering event [e.g., 1,2]. For each sample, we will perform Ar-Ar analysis on at least three samples each of impact melt and unmelted clasts, to use the different thermal histories the different types of material have experienced to try to maximize the amount of chronological information we can obtain about each meteorite [4].

Our current set of samples, which have been studied petrographically, have undergone neutron irradiation for Ar-Ar dating, and are being analyzed for Ar-Ar, includes the following: NWA 1701, an LL chondrite impact melt breccia whose Ar-Ar systematics indicate an impact no more than ~2.8 Ga ago (younger than previously documented LL impacts); NWA 2058, an meteorite of H chondrite composition that is more than 90% impact melt.; Gao-Guenie, and H with impact melt veins; LAP 02240, and H impact melt breccia; and NWA 2085, an L impact melt breccia whose chronology has not previously been studied. Additional data will be presented at the meeting.

References: [1] Kring D. A. et al. (1996) *Journal of Geophysical Research*, 101, 29,353-29,371. [2] Kring D. A. et al. (1999) *Meteoritics & Planetary Science*, 34, 663-669. [3] Kring D. A. et al. (2000) *Lunar & Planetary Science XXXI*, Abstract 1688. [4] Grier J. A. et al. (2004) *Meteoritics & Planetary Science*, 39, 1475-1493. [5] Bogard D. D. (1995) *Meteoritics*, 30, 244-268. [6] Schmitz B. et al. (2003) *Science*, 300, 961-964.