CLAST-RICH H-CHONDRITE IMPACT MELTS.
A. Wittmann[1], T. D. Swindle[2], D. A. Kring[1]. [1]Lunar and Planetary Institute, Houston, TX 77058. wittmann@lpi.usra.edu, kring@lpi.usra.edu. [2]Lunar and Planetary Laboratory, Tucson, AZ 85721. tswindle@u.arizona.edu.

Introduction: The H-chondrite parent asteroid provides the second-most abundant type of meteorites that currently reach Earth's surface [1]. These rocks recorded their parent asteroid's collisional history and melted H-chondrites chronicle the most severe cratering events.

Samples and Methods: Seven samples of clast-rich impact melt rocks from the La Paz Icefield, Antarctica were analyzed in thin sections: LAP 031308, 031173, 031125, 03922, 04462, 02240 [2], 04751 [3]. Plausible scenarios of their formational settings are reconstructed from petrologic characteristics.

Summary: All samples contain densely crystallized impact melt, which suggests large degrees of undercooling and, thus, very rapid quenching from initial post-shock temperatures >1500°C [4]. Lithic clasts of petrographic types 4 – 6 occur in abundances between 6 – 70vol.% with sizes of ~15µm – >1cm. These lithic clasts exhibit a range of shock stages up to S5 [4] and the compositions of olivines and low-Ca pyroxenes are typically in the range of H-chondrites. Relative degrees of quenching are revealed from the size distribution of metal-troilite globules in the melts, with more slowly quenched samples exhibiting a skew towards larger globule diameters. The analysis of globule sizes and spacings according to the method of [5] reveals cooling rates in the temperature range of ~1400 – 950ºC of 0.8 – 40ºC/s. The lack of secondary kamacite rims indicates rapid cooling through the temperature interval between ~700 – 400ºC at rates >100ºC/yr. These cooling rates suggest the samples were derived from melt volumes ~0.5 – 5cm in diameter that cooled radiatively. Very shallow burial depths, likely <10m are thus indicated [6]. Because these melts do not exhibit characteristic droplet shapes, they unlikely cooled during ejection but more probably formed small melt pods in suevitic debris. Melted H-chondrites amount to ~1% of the total mass of H-chondrites recovered in Antarctica [7]. Available Ar-Ar data reveals impact events at 3.94 Ga (LAP 02240 and LAP 031125), 0.75 Ga (LAP 031308), and 0.4 Ga (LAP 03922) [8]. Comparison with the ages of petrographically similar (e.g., Orvinio) and more slowly cooled H-chondrite impact melts (Ourique, Rose City) [6, 9] may indicate that impacts older than 3.6 Ga [8] produced more extensive impact melting on that asteroid. The younger ages correspond to thermal overprints from late impact events, which, so far, were not sampled as slowly cooled melts.

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