SHOCK VEINS IN L6 CHONDRITES AND CONSTRAINTS ON THE IMPACT HISTORY OF THE L6 PARENT BODY. T. G. Sharp[1], Z. Xie[2] and P. S. De Carli[2], [1]School of Earth and Space Exploration, Arizona State University, Tempe, AZ 85287, U.S.A. tom.sharp@asu.edu, [2]Nanjing University, Nanjing China zhidongx@nju.edu.cn [3]SRI International, 333 Ravenwood Ave., Menlo Park, CA 94025, paul.decarli@sri.com

Introduction: High-pressure minerals that occur in and adjacent to shock-induced melt veins in chondrites provide constraints on the pressures and temperatures of shock metamorphism in these samples [1-3]. The duration of the shock pulse in such samples can be constrained by either using silicate-transformation kinetics [4-6] or by modeling melt vein cooling [1, 7-8]. Impact velocities and impactor sizes can be calculated from pressure and duration data using simple planar-shock-wave approximations [8] or by hydrodynamic calculations [9]. In this study we use hydrodynamic calculations to explore possible impact conditions and sample locations on the L6 parent body for the highly shocked L6 chondrite RC106 [10].

Results: The melt vein in RC106 is 1.3 mm to 4-mm wide with a crystallization assemblage consisting of majorite garnet plus magnesiowüstite. There are two important features of this assemblage: 1) the mineralogy is constant throughout the veins, implying that melt-vein crystallization occurred under near isobaric conditions between 18 and 25 GPa; and 2) the vein contains a textural transition from large equant majorite garnets (up to 30-µm wide) in the vein center to finely dendritic majorite near the melt-vein edge. These textures are consistent with rapid cooling of the vein margin by conduction to a relatively cool host rock. Melt-vein cooling was modeled by assuming a planar melt vein at an initial temperature of 2500 K, surrounded by the solid host rock at 400 K. Using thermal conductivity values of 10 and 3 W/m^2, the center of a 1.3-mm melt vein would quench to the solidus in 165 and 550 ms, respectively.

To model possible impact scenarios, we assume a spherical L-chondritic impactor striking a much larger L-chondritic body. By placing pressure gauges throughout the model, we can investigate the pressure-time history of any position in the parent body. Assuming a porous surface regolith on the parent body, a 4km/s impact with a 10 km chondritic object can produce an RC106-like shock pulse for a sample at 8 km depth in the L-chondrite parent body.

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