Characteristics in Experimentally and Naturally Shocked Chondrites: a clue to P-T Conditions of Impacted Asteroids

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The aim of this study is to compare the experimentally shock-induced features with those in naturally shocked chondrites and to test the feasibility of calibrating shock features in naturally shocked H- and L-chondrites. Samples of Jilin H5 chondrite were experimentally shock-loaded at peak pressures of 12, 27, 39, 53, 78, 83, 93, and 133 GPa respectively. Our optical, SEM, EPMA and Micro-Raman spectroscopic studies on shock-loaded samples show that no high-pressure phases observed in any of the shocked samples, neither in the deformed nor in the molten regions. Chondritic melts were firstly obtained at P>78 GPa. At 78 GPa, about 15% whole-rock melting occurred whereas 20% melting at 83 GPa,, and up to 30% melting at 93 GPa were observed, and more than 60% melting was achieved at P~133 GPa. Textural relations and mineral assemblages of the shock-loaded samples are comparable to those encountered in many naturally shocked H-chondrites (Yanzhuang type), but differ considerably from those found in naturally shocked L-chondrites (Sixiangkou type). Shock melt veins in many L6 chondrites contain high-pressure polymorphs of olivine and pyroxene and high-pressure liquidus phases. It is evident that the P-T conditions prevailed during the formation of these two distinct types of melt regions were entirely different. In contast to the Sixiangkou type melt veins, the Yanzhuang type melt materials obviously crystallized from the shock-induced melt after *pressure release. Therefore, scaling from shock experiments on* millimeter-sized samples to natural shock features on kilometer-sized asteroids poses considerable problems in quantifying the P-T conditions during natural shock events on asteroids.