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High-pressure phase analyses in shock-melt veins: New L6 chondrite in Queensland, NE Australia

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We investigate the high-pressure mineral phases in the shock-induced melt veins in new L6 chondrite obtained from Queensland in NE Australia. The preliminary research shows that the shock veins contain a number of high-pressure phases including ringwoodite, majorite, akimotoite, hollandite-structured plagioclace, which are fragments of the solid-state transformation of chondrite matrix. We conducted petrographic observations and laser-Raman micro-analyses for high-pressure mineral phases in/adjacent the melt veins of new chondrite to estimate the pressure- and temperature- conditions during shock event. The melt-veins show three distinct textures corresponding to distance from host chondrite; 1) vein edges 30-um-wide show mineral assemblage of majorite + ringwoodite + akimotoite with minor rounded metal-sulfide, 2) the middle of the vein 730-um-wide contains majorite + magnesiowustite with irregular-shaped metal-sulfide, 3) the outer rim of the melt vein consists of glass which can represent silicate melt under high-pressure and temperature conditions. These distinct differences of texture and constituent indicate heterogeneity of quench rate in the melt vein. Although the mineral assemblages in the vein edge and centre are distinctly different, the pressure range of both assemblages are consistence with crystallization from similar pressure conditions. The matrix in the vein edge crystallized at about 23-25 GPa and in the vein center crystallized at about 21-25 GPa. The estimation of crystallization pressure suggests that silicate melt with high-pressure phases in the vein quenched and consolidated during pressure pulse remained.

Keywords: Shock-melt vein, L6 chondrite, laser-Raman spectroscopy