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Laser shock-induced melting and fragmentation in metals DIDIER LOISON, ENSMA, THIBAUT DE RESSEGUIER, ANDRE DRAGON, EMILIEN LESCOUTE, MICHEL BOUSTIE, CNRS, LAURENT BERTHE, PIMM — Full or partial melting under shock compression or upon release following a shock wave and subsequent fragmentation in the melted state are still essentially open questions in most metals. We present laser shock experiments performed on tin and aluminium, to pressures ranging from about 60 to 250 GPa. Diagnostics include Photonic Doppler Velocimetry (PDV) measurements of the free surface velocity, transverse observations of the expanding cloud of droplets sometimes referred to as "micro-spall," and soft recovery of such droplets within a low density gel. Multi-phase equations of state are used to infer the evolution of the thermodynamic state along shock propagation distance, accounting for the decay of the loading pressure pulse, and for the presence of mixed regions in the phase diagrams. Experimental observations are interpreted on the basis of hydrodynamic simulations of laser-matter interaction and shock response involving similar multi-phase equations of state.

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