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Orientation dependence of shock-induced melting in crystalline aluminum IVAN OLEYNIK, MIKALAI BUDZEVICH, VASILY ZHAKHOVSKY, University of South Florida, CARTER WHITE, Naval Research Laboratory — The complete evolution of metastable states during shock-induced solid-liquid phase transitions in crystalline aluminum was observed in moving window molecular dynamics simulations. The orientation-dependent transition pathways towards orientation-independent final equilibrium states include both "cold melting" followed by resolidification in [110]- and [111]-oriented shock waves, and crystal overheating followed by melting in [100] shock waves. Such orientation-dependent dynamics of solid-liquid phase transitions takes place within an extended zone up to hundreds of nanometers behind the shock front, which makes it accessible for experimental observation.

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