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A Method for Obtaining Melt Curves using Laser Compression and X-Ray Diffraction[1] CAROLINE LUMSDON, ANDREW HIGGINBOTHAM, University of York — The phase boundary between solid and liquid is a key material property, influencing for example, planetary structures. In extremis, such as pressure relevant to supergiant planets, dynamic processes such as laser compression are generally necessary to reach the conditions of interest. In these experiments, x-ray diffraction can be recorded from solid and liquid material as the system crosses the P-T conditions of the melt curve, and thus the density in the two systems is directly measured. The densities and coexistence condition taken together allow the thermodynamic conditions on the melt curve to be constrained. However, since the melting temperature is dependent on the heating (and therefore loading) rate of the material care must be taken in interpreting dynamically determined melt curves. We present molecular dynamics simulations of dynamic melting during compression and release of samples. By utilising a dynamic-tamper technique we are able to simulate, at low computational cost, the effect of tamper material on release rate, and to investigate the effect of melting kinetics on observed melt onset. We will discuss the feasibility of experimental approaches to dynamic determination of melt curves, and of measuring melting kinetics.

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