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Ejecta size distribution from the dynamic fragmentation of shock-loaded Cu and Sn metals under melt conditions OLIVIER DURAND, LAURENT SOULARD, CEA, DAM, DIF, F-91297 Arpajon, France — Large scale molecular dynamics (MD) simulations are performed to study and to model the ejecta production from the dynamic fragmentation of shock-loaded metals under melt conditions. A generic 3D crystal with about 10^8 atoms in contact with vacuum and with a sinusoidal free surface roughness is shock loaded above its fusion point. Two metals are studied (Cu and Sn) and the amplitude of the roughness is varied. The simulations show that the associated time resolved ejecta mass (or size) distributions exhibit a generic behavior with the sum of two distinct terms: in the small size limit, the distribution obeys a power law dependence and in the large size limit, it obeys an exponential form. With the help of additional simple simulations, we show that these two components are the signature of two distinct basic mechanisms of fragmentation. The power law dependence results from the fragmentation of a 2D fractal network of ligaments of liquid metals generated during the ejection process. The exponential distribution results from a 1D Poisson fragmentation mechanism of the largest ligaments previously generated.

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