Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

A computational study of the impact of molten drops onto textured surfaces MEHDI RAESSI, University of Massachusetts-Dartmouth, RAJKAMAL SENDHA, Indian Institute of Technology Bhubaneswar — We used an in-house, three-dimensional computational tool to study the impact and spreading of molten drops onto substrates with various surface patterns. The computational tool is GPU-accelerated and solves the mass, momentum and energy equations in the liquid phase and the conduction equation in the substrate. The drop, 40 μm in diameter, is molten alumina, which is widely used in the thermal spray coatings. The surface patterns are created by positioning cuboid obstacles that their side dimension is at least 3 μm. We investigated the effects of obstacle height, aspect ratio and spacing as well the impact velocity on the spreading dynamics and the final geometry of the drop. In our study, the impact velocity was varied from 40 to 90 m/s, the obstacle height from 1 to 5 μm, and the obstacle spacing from 2 to 26 μm. The results show that the flattened drop has a disk-shape geometry when the obstacle spacing is either smallest or largest, and that significant deformations and fingering occur at the intermediate spacings. A quantitative relation was developed between the obstacle spacing and the final spread diameter of the drop. The results show the collapse of the final spread diameter normalized by the obstacle spacing when plotted against the spacing at different impact velocity and obstacle height.

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Date submitted: 02 Aug 2011 Electronic form version 1.4