Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

The Leidenfrost temperature increase for impacting droplets on carbon-nanofiber surfaces HENDRIK STAAT, HRUDYA NAIR, University of Twente, TUAN TRAN, Nanyang Technological University, ARIE VAN HOUSELT, University of Twente, ANDREA PROSPERETTI, Johns Hopkins University, DETLEF LOHSE, CHAO SUN, University of Twente — When a droplet impacts a smooth solid plate that is heated to a temperature above the boiling point of the liquid, the droplet will evaporate upon impact. Above a certain threshold plate temperature, a vapor film between the plate and the droplet prevents direct contact during impact due to the dynamic Leidenfrost effect. This state is unwanted in applications like spray cooling, as vapor limits the heat transfer from the solid to the liquid. We show that the dynamic Leidenfrost temperature for droplets that impact on a surface covered with carbon-nanofibers is higher than on the surface without these nanofibers. This is attributed to the cooling effect that vapor has on the superheated nanofibers. Because of the small scale of the carbon fibers, they are cooled by the vapor flow just before the liquid impact, resulting in a higher dynamic Leidenfrost temperature than on smooth surfaces.

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Date submitted: 31 Jul 2014 Electronic form version 1.4