Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Behavior of severely supercooled water drops impacting on superhydrophobic surfaces[1] TANMOY MAITRA, CARLO ANTONINI, Laboratory of Thermodynamics in Emerging Technologies, Mechanical and Process Engineering Department, ETH Zurich, MANISH K. TIWARI, Department of Mechanical Engineering, University College London, ADRIAN MULARCZYK, ZULKUFLI IMERI, PHILIPPE SCHOCH, DIMOS POULIKAKOS, Laboratory of Thermodynamics in Emerging Technologies, Mechanical and Process Engineering Department, ETH Zurich — Surface icing, commonplace in nature and technology, has broad implications to daily life. To prevent surface icing, superhydrophobic surfaces/coatings with rationally controlled roughness features (both at micro and nano-scale) are considered to be a promising candidate. However, to fabricate/synthesize a high performance icephobic surface or coating, understanding the dynamic interaction between water and the surface during water drop impact in supercooled state is necessary. In this work, we investigate the water/substrate interaction using drop impact experiments down to -17°C. It is found that the resulting increased viscous effect of water at low temperature significantly affects all stages of drop dynamics such as maximum spreading, contact time and meniscus penetration into the superhydrophobic texture. Most interestingly, the viscous effect on the meniscus penetration into roughness feature leads to clear change in the velocity threshold for rebounding to sticking transition by 25% of supercooled drops.

[1]Swiss National Science Foundation (SNF) grant 200021_135479.

Tanmoy Maitra
Laboratory of Thermodynamics in Emerging Technologies,
Mechanical and Process Engineering Department, ETH Zurich

Date submitted: 20 Jul 2014 Electronic form version 1.4