Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Insight into drop runback on hydrophilic to superhydrophobic surfaces by shearing airflow ANDREW J.B. MILNE, ALIDAD AMIRFAZLI, Department of Mechanical Engineering, University of Alberta, Edmonton, AB, T6G 2G8, Canada — Drop runback has many diverse applications including airfoil icing and fuel cell flooding. In this talk, we use surface science and fluid dynamics principles to explain incipient runback for a drop exposed to shearing airflow. Through experiments with single drops of water and hexadecane (0.5-100 μl) on PMMA, Teflon, and a superhydrophobic aluminum surface (SHS), wetting parameters such as surface tension, drop shape and contact angle are found to be major controllers of the minimum required air velocity for drop shedding. Exponential functions are proposed that relate air velocity to drop base length and projected area. By normalizing the results, the three water systems can be collapsed to a single curve that also explains results from other researchers, vastly increasing predictive power. SHS are seen to shed drops more easily compared to the other surfaces, with evidence that the drops roll along the surface instead of sliding. Using high speed video, oscillating drop shape and variation of contact angles are also analyzed as they change with air and drop speed.

Andrew J. B. Milne
Department of Mechanical Engineering, University of Alberta,
Edmonton, AB, T6G 2G8, Canada

Date submitted: 11 Aug 2009 Electronic form version 1.4