

Meeting: 1005, Newark, Delaware, SS 7A, Special Session on Frontiers on Complex Fluid Flows: Analytic and Computational Methods

1005-76-181 **Jia Ou** and **Jonathan P. Rothstein*** (rothstein@ecs.umass.edu), 160 Governors Drive, Amherst, MA 01003. *Drag Reduction and Micro-PIV Measurements of the Flow Past Ultrahydrophobic Surfaces.*

We will present a series of experiments which study in detail the flow kinematics of water past hydrophobic surfaces with well-defined micron-sized surface roughness. These 'ultrahydrophobic' surfaces are fabricated from silicon wafers using photolithography and are designed to incorporate precise patterns micron-sized ridges and posts. These features are made hydrophobic through a chemical reaction with an organosilane. An experimental flow cell is used to measure the pressure drop and the velocity profile as a function of the flow rate for a series of rectangular cross-section microchannel geometries and ultrahydrophobic surface designs. Pressure drop reductions up to 40% are obtained using these ultrahydrophobic surfaces. A physical model will be presented which explains the drag reduction in terms of a shear-free air-water interface between microposts supported by surface tension. The velocity profile across the microchannel is determined through micro particle image velocimetry (micro-PIV) measurements. Slip velocities of up to 50% the average velocity are found along the air-water interface supported between the hydrophobic microridges. The experimental measurements are compared to numerical simulations and the predictions of analytical theory with good agreement. (Received February 08, 2005)