Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Nanowettability by saline solutions in electric field[1] ALENKA LUZAR, Department of Chemistry, Virginia Commonwealth University (VCU), 1001 West Main Street, Richmond, VA 23284-2006, C.D. DAUB, D. BRATKO, Department of Chemistry, VCU — Molecular simulations of nanosized aqueous droplets and films next to apolar surfaces show a remarkable sensitivity of water contact angles on the applied electric field polarity and direction relative to the liquid/solid interface. We explain the effect by analyzing the influence of the field on interfacial hydrogen bonding which in turn affects the interfacial tensions. When electric field is applied on the aqueous film in the direction perpendicular to the confining hydrophobic surfaces, the competition between field-induced alignment and orientational preference of interfacial water molecules relative to the surfaces results in asymmetric wettability of opposing surfaces (Janus interface). The observed anisotropy in droplet or film wetting is a new nanoscale phenomenon that has so far been elusive as, in current experimental setups, surface molecules represent a very low fraction of the total number of molecules, affected by the field. We discuss amplification of these effects in saline solutions. The work gives basic understanding of field charge effects that can modulate local hydrophilicity of engineered and biological interfaces, as well as surface manipulation in nanofluidic devices.

[1]supported by NSF.

Alenka Luzar
Department of Chemistry, Virginia Commonwealth University (VCU),
1001 West Main Street, Richmond, VA 23284-2006

Date submitted: 25 Nov 2007 Electronic form version 1.4