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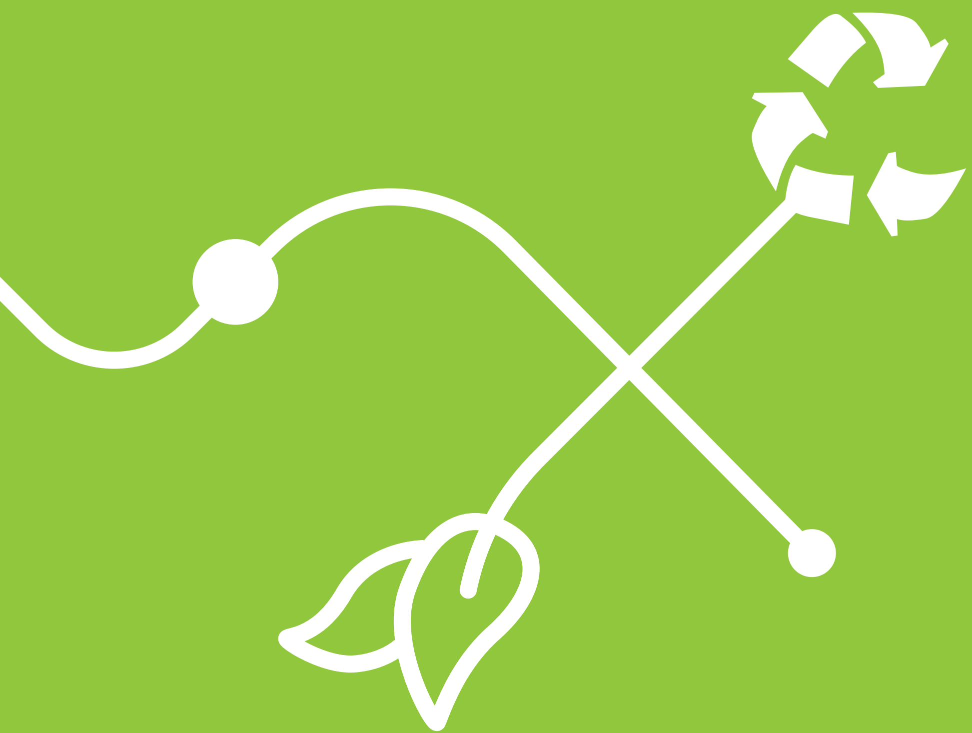

Oxidation effects on thin polystyrene films in water

P05.13

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We study the effect of oxidation on the properties of atactic polystyrene surfaces by atomistic molecular dynamics simulations. The chemical modification of the polymeric surface continuously changes its hydrophobic/hydrophilic character. We analyse the change in the surface roughness and orientation of polymeric chains near the surface due to oxidation and in the presence of water. We observe a pronounced smoothening of the hydrophobic polymer surface in water. Additionally, we study the change in water structure near the surface as function of the hydrophilic character of the surface. The water shows a preferred orientation near the hydrophobic surface.

An in-situ nano-tensile tester for time-dependent mechanics of metallic MEMS

P05.14

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Free-standing metallic thin films are increasingly used as structural components in MEMS. In commercial devices long-term reliability is essential, which requires determining time-dependent mechanical properties of these films. The uniaxial tensile test is a preferred method due to uncomplicated determination of the stress and strain state. However, at the MEMS-scale this is not straightforward: specimen handling, loading, force and displacement measurement need careful consideration. Here we discuss the challenges of the application and measurement of nN forces and nm deformations in on-chip test structures during long periods. We then present a novel tensile-testing instrument with in-situ capabilities in SEM and Optical Profilometry.

Electrostatic doping of graphene on an ultrathin h-BN dielectric

P05.15

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Measurements of the conductivity[1] and work function[2] of gated graphene devices exhibit a square-root dependence of the Fermi level on the back-gate voltage. The minimum conductivity is not found when the back-gate voltage is zero but at an offset V_D. The doping level depends on the work function of the metal substrate[3], the back-gate voltage, the susceptibility and thickness of the dielectric buffer layer. Here we present a simple analytical model that describes the square root dependence of the doping level in a gated graphene device and confirm its validity with DFT-LDA calculations for metal|h-BN|graphene structures in a static electric field.

[1] Nat Phys 4, 627 (2008).
[2] Nano Lett 9, 3430 (2009).
[3] PRL 101, 026803 (2008).