



Beitrag ID: 38

Typ: Keynote

Energy harvesting due to charge redistribution upon drop impact & Swelling of partly saturated hydrophobic polymer brush layers

Montag, 8. November 2021 16:00 (45 Minuten)

The first part of this lecture I discuss how the energy of falling drops impacting onto pre-charged hydrophobic polymer surfaces can be harvested in an external electrical circuit as screening charges redistribute within the drop.

High speed video imaging and simultaneous electrical measurements lead to a physical model of the energy conversion process including a quantitative analysis of the conversion efficiency [1, 2].

Part two addresses preliminary experiments on the spreading of oil drops with a low vapor pressure on hydrophobic polymer brushes. Within a few hours the swelling process leads to the formation of a pronounced halo around the macroscopic contact line, where the thickness of the partially swollen brush layer varies by a few hundred nanometers over a lateral width of the order of 1mm. The experiments suggest that this seemingly static configuration is in fact stabilized by a very slow gradual evaporation and therefore intrinsically a non-equilibrium phenomenon.

[1] Wu, H., et al., Energy Harvesting from Drops Impacting onto Charged Surfaces. *Physical Review Letters*, 2020. 125: 078301.

[2] Wu, H., et al., Charge Trapping-Based Electricity Generator (CTEG): An Ultrarobust and High Efficiency Nanogenerator for Energy Harvesting from Water Droplets. *Advanced Materials*, 2020. 32: 2001699.

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