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# Dynamic Wetting of Adaptive Polyelectrolyte Substrates: A multiscale approach

Studying wetting phenomena is of great importance across a wide range of scientific disciplines. As a fundamental research area, wettability dynamics of adaptive and responsive substrates gained significant attention. These substrates include polyelectrolyte multilayers (PEM), Poly-N-isopropylacrylamide (PNIPAM) microgels (MG), and Polydimethylsiloxane pseudo-brushes (PDMS brushes), among others. Notably, an interesting property of polyelectrolyte (PE) substrate is their propensity to swell in a liquid environment, yet the complexities like disparity between time and length scales, and surface deformation beyond the three-phase contact line (TPCL) makes experimental investigations to be quite challenging. Here, we prepare PE substrates by the layer-by-layer method invented by Decher and coworkers [1], with a focus on their wettability at the nanoscale. We use atomic force microscopy (AFM) as the main characterization technique at the nanoscale for investigation of layer properties, swelling kinetics, saturation, with an optical contact angle (CA) tensiometry method for measurements at macroscopic scale. The layer thickness is determined by ellipsometry. The results show that the water CA on silicon wafers coated with polystyrene sulfate (PSS) as outermost layer decreases in water-saturated atmosphere as previously described by Hänni-Ciunel et al. [2]. Furthermore, the PDMS brushes CA measurements are compared to these of PEM of different composition and layer thickness. Here fore, the dip protocol was adjusted to fabricate different PEMs consisting of PEI/PSS/PAH with different layer thickness, polyanion or polycation as outermost layer and addition of NaCl. [3]

[1] G. Decher, Science 1997, 1232 –1237.

[2] K. Hänni-Ciunel, G. H. Findenegg, R. v. Klitzing, Soft Materials 2007, 61 –73.

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**Hauptautor:** MELTSCHOCH, Mona (TU Darmstadt)

**Co-Autoren:** HORMOZI, Mohammad Ali; VON KLITZING, Regine (TU Darmstadt)

**Vortragende(r):** MELTSCHOCH, Mona (TU Darmstadt)