Beitrag ID: **9** Typ: **Talk**

Dynamic Wetting and Molecular Switching of Photo-Responsive Arylazopyrazole Phosphonic Acid Monolayers on Aluminum Oxide Surfaces

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Smart surfaces that can change their wetting behavior on demand are interesting for applications such as self-cleaning surfaces. In order to functionalize aluminum oxide surfaces, we have synthesized arylazopyrazole phosphonic acids (butyl-AAP-C_{18}PA) that represent a new class of photoswitchable molecules for these oxide surfaces. Butyl-AAP-C_{18}PA monolayers were deposited on α-Al_2O_3(0001) and we show that E to Z photo switching of butyl-AAP-C_{18}PA can trigger a contact angle change by ~10°. For that we monitored the changes on the macroscopic level by recording the dynamic contact angle, while time-resolved vibrational sum-frequency generation (SFG) spectroscopy provided information on the molecular level as well as on the kinetic changes within the AAP monolayer. Further, we show that a steep decrease in contact angle after initiating E to Z switching with UV irradiation is accompanied by a substantial reduction of the aromatic C-H modes and a non-resonant electronic contribution to the SFG spectra which are both attributable to AAP moieties. In the Z configuration the exposed polar azo groups of the AAP molecules are susceptible to interactions with interfacial water. We show that water can stabilize the Z configuration and hinder the AAP monolayer to switch back into the E state when it is immersed in H_2O, while also water from the gas phase is important for E/Z switching. This is evidenced from substantially different thermal stabilities of the Z configuration in gas phases with different relative humidity. Having established the characteristic times for switching on the molecular scale, we have modelled the dynamic contact angle and demonstrate, for the system in our study, that the wetting dynamics are mostly synchronized to the changes on the molecular level.

Primary authors: HONNIGFORT, Christian (WWU Münster); GARCIA REY, Natalia (WWU Münster); BRAUNSCHWEIG, Björn (WWU Münster)

Vortragende(r): BRAUNSCHWEIG, Björn (WWU Münster)

Sitzung Einordnung: Short talks