

## Electro(de)wetting with Photoswitches: Control of wetting by electric fields and light

Electro-dewetting (EDeW) was introduced as a novel method to modify surface wetting properties. By using ionic surfactants like dodecyl tetrethyl ammonium bromide (DTAB), the wettability of hydrophilic silicon oxides on a conductive Si substrate can be controlled through an applied electric potential, resulting in an increased contact angle. This behavior is significantly influenced by the pH of the aqueous solution, surfactant concentration, and the applied potential driving EDeW [1]. However, the underlying mechanism remains unclear. For that reason additional experiments are necessary.

In this contribution, we report on EDeW experiments using classical DTAB surfactants which confirm previous results [1], while we also report on the application of new cationic photoswitchable surfactants namely azobenzene triethylammonium bromide (Azo-TB) [2], arylazopyrazole triethylammonium bromide (AAP-TB) [2] and butyl-arylazopyrazole triethylammonium bromide (butyl-AAP-TB) for EDeW. These photoswitches can undergo E/Z photoisomerization reactions that cause drastically changes in surface activity [2]. This offers to fine tune the contact angle changes by E/Z photoisomerization of the AAP-TB amphiphile and we find a further increase in contact angle by about 6° when the samples were irradiated by UV light that triggers the photoisomerization from the E to the less surface-active Z isomer. In previous work [1], it was suggested that surfactants are deposited on the silicon oxide surface through the EDeW process. In order to study the possible deposition of surfactants and the role of a possible prewetting layer outside of the drop and at some distance from the 3-phase contact line we have done SFG spectroscopy and find that surfactants are deposited even several mm adjacent to the drop and that the structure of this surfactant layer as well as the structure of the accompanying water layer changes drastically close to the 3-phase contact line.

[1] J. Li, Noel. S.Ha, T Leo Liu, R. Michael van Dam, CJ Kim; *Nature*, 572, 507–510 (2019).

[2] M. Schnurbus, R.A. Campbell, J. Droste, C. Honnigfort, D. Glikman, P. Gutfreund, M.R. Hansen, B. Braunschweig; *J. Phys. Chem. B.* 124, 6913–6923 (2020).

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