

MOLECULAR INTERACTIONS AT SOLID–LIQUID INTERFACES

Andreas Furchner, Annika Kroning, Timur Shaykhtudinov, and Karsten Hinrichs

Leibniz-Institut für Analytische Wissenschaften – ISAS – e. V.,
12489 Berlin, Germany

We use our latest advancements in infrared-spectroscopic ellipsometry (IR-SE) [1] to probe molecular interactions, hydration states, and structure of end-grafted, nanometer-thin polymer films at the solid–liquid interface. Employing the powerful approach of optical modeling enables us to interpret measured in-situ spectra quantitatively and in a physically and chemically meaningful way.

We elucidate the role of inter- and intramolecular hydrogen-bond interactions in the temperature-induced swelling–deswelling phase-separation of poly(*N*-isopropylacrylamide) [1] and poly(2-oxazoline) brushes [2]. We find a complex interplay between molecular interactions, hydration, and swelling around the film's lower critical solution temperature in water, showing that—contrary to widespread belief—the brushes remain hydrophilic even in their dehydrated collapsed states.

Pushing the limits of IR-SE, we are even able to quantify molecular interactions in the subnanometer-thin interface layer between water and a 2 nm ultrathin poly(glycidylmethacrylate) film.

[1] Furchner, A.; Kroning, A.; Rauch, S.; Uhlmann, P.; Eichhorn, K.-J.; Hinrichs, K., “Molecular Interactions and Hydration States of Ultrathin Functional Films at the Solid–Liquid Interface,” *Analytical Chemistry* **2017**, 89 (6), 3240–3244. DOI: 10.1021/acs.analchem.7b00208.

[2] Kroning, A.; Furchner, A.; Adam, S.; Uhlmann, P.; Hinrichs, K., “Probing carbonyl–water hydrogen-bond interactions in thin polyoxazoline brushes,” *Biointerphases* **2016**, 11 (1), 019005-1–7. DOI: 10.1116/1.4939249.