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Effect on Conformational Transformation of Methyl Side Group in Poly(sulfobetain)-Based Thermo-responsive Block Copolymer Thin Films

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Classic zwitterionic poly(sulfobetaine)s, poly(4-((3-methacrylamidopropyl)dimethyllammonio)butane-1-sulfonate)) (PSBP), which exhibit an upper critical solution temperature (UCST) in aqueous media, have been widely used to investigate its swelling/deswelling behavior and phase transition mechanism. Also its block copolymers reached high attention if they contain other broadly studied nonionic thermo-responsive polymers, especially poly(N-isopropylacrylamide) (PNIPAM) and poly(isopropylmethacrylamide)(PNIPMAM), which feature a lower critical solution temperature (LCST) in aqueous solution, normally higher than UCST of PSBP. However, a comparison between the block copolymer films of PSBP-b-PNIPAM and PSBP-b-PNIPMAM, with a similar degree of polymerization and thickness of film, is still missing. We present a comparison of the humidity- induced swelling/deswelling behavior of block copolymer thin films of PSBP-b-PNIPAM and PSBP-b-PNIPMAM with a similar degree of polymerization and thickness in aqueous vapor atmosphere as studied by time-of-flight neutron reflectometry (TOF-NR). Ellipsometer results, when adjusting the spin coating parameters, contributed to control the thickness to 50-60 nm. The resulting polymer films were also characterized by Fourier transform infrared (FTIR) spectroscopy.

Primary authors: Mr WANG, Peixi (Workgroup Polymer Interfaces, TUM Department of Physics, Technical University of Munich); Mr P. KREUZER, Lucas; Ms GEIGER, Christina; Prof. MÜLLER-BUSCHBAUM, Peter

Presenter: Mr WANG, Peixi (Workgroup Polymer Interfaces, TUM Department of Physics, Technical University of Munich)

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