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Phase transition kinetics in a doubly thermo-responsive poly(sulfobetaine)-based block copolymer thin film

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Thermo-responsive polymers show a strong change in volume towards slight changes of their surrounding temperature. While this behavior is well understood for polymers in solution, less is known about the underlying mechanisms in thin film geometry. In our work, we investigate the phase transition kinetics upon increasing temperature in a thermo-responsive block copolymer thin film, that shows both, upper and lower critical solution temperature (UCST and LCST) behavior. Time-of-flight neutron reflectometry (ToF-NR) is used to follow the phase transition kinetics with high time resolution. At temperatures, below the UCST, the polymer film is first swollen in D2O atmosphere to increase the mobility of the polymer chains. Subsequent, temperature is increased to an intermediate regime (between UCST and LCST) and high regime (above LCST). In addition ToF grazing incidence small angle neutron scattering (GISANS) measurements are performed at the beginning and in between the kinetic processes to gain detailed information about the thin film morphology at different temperatures.

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