

Co-nonsolvency-Triggered thin Films Contraction of Poly(sulfobetaine)-based Diblock Copolymer Thin Films in Water/Acetone Atmosphere

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Motivation

Desiging smart polymers for thermo sensors;

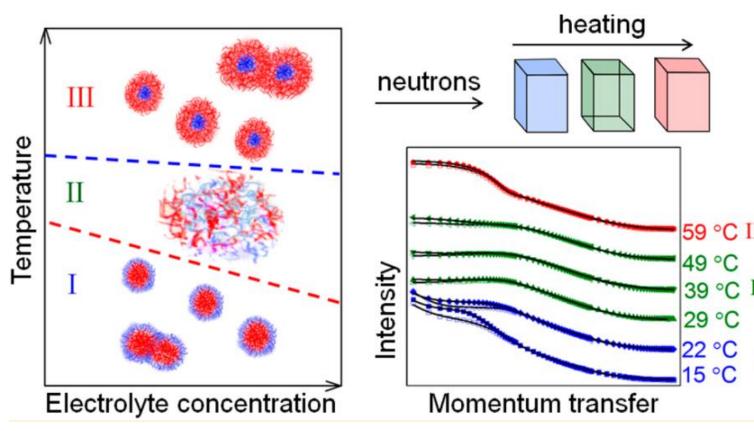
Modeling size controlled nanoparticle precipitation;

> Realizing functional application of smart polymers.

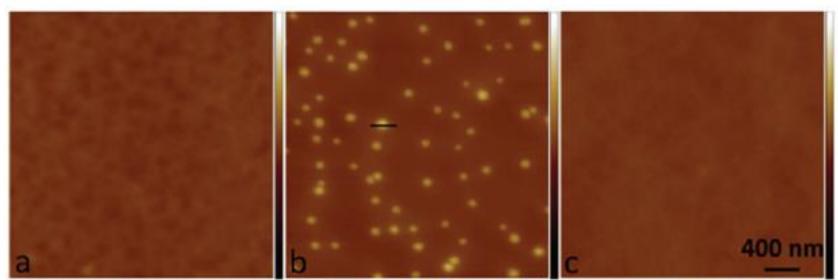
Co-nonsolvency occurs if a mixture of two good solvents causes the collapse or demixing of polymers into a polymer-rich phase in a certain range of compositions of these two solvents. Cononsolvency response of Poly(sulfobetaine)-based block copolymer thin films containing the zwitterionic PSBP is newly studied. We focus on the co-nonsolvency behavior of PSBP-*b*-PNIPMAM thin films in a series of deuterated binary mixtures.

Expected structures of PSBP-*b***-PNIPAM in**

aqueous solution

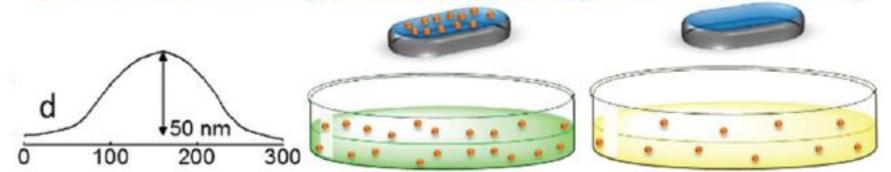


Applicatons serving as a pick-up move and release system



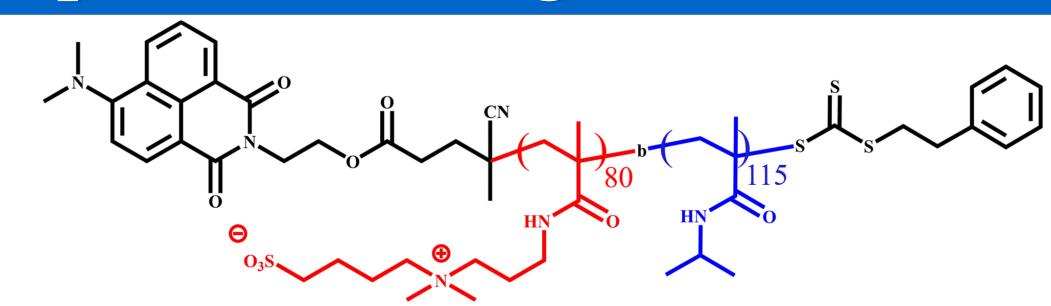
Keßler, S *et al*, Modeling size controlled nanoparticle precipitation with the co-solvency method by spinodal decomposition. *Soft Matter* **2016**, 12, (34), 7231-7240.

Natalya S. Vishnevetskaya *et al*, Aggregation behavior of doubly thermoresponsive polysulfobetaine-b-poly(N-isopropylacrylamide) diblock copolymers. *Macromolecules* **2016**, 49, (17), 6655-6668.

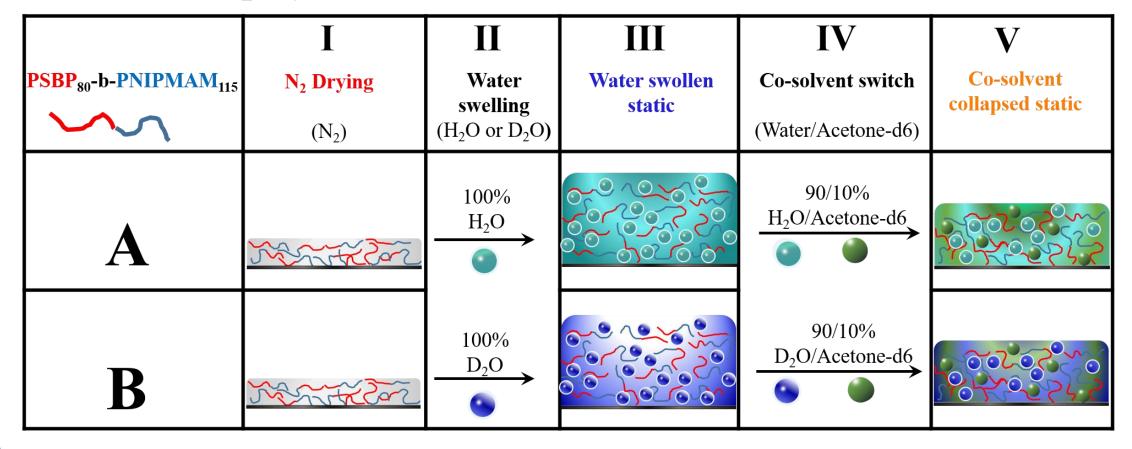


Yunlong Yu *et al*, Pick up, move and release of nanoparticles utilizing co-non-solvency of PNIPAM brushes. *Nanoscale* **2017**, 9, (4), 1670-1675.

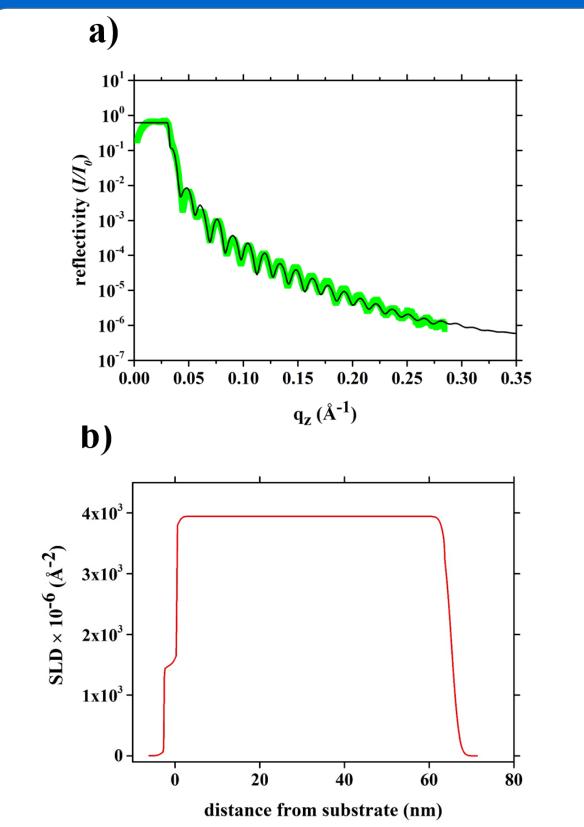
Experimental design



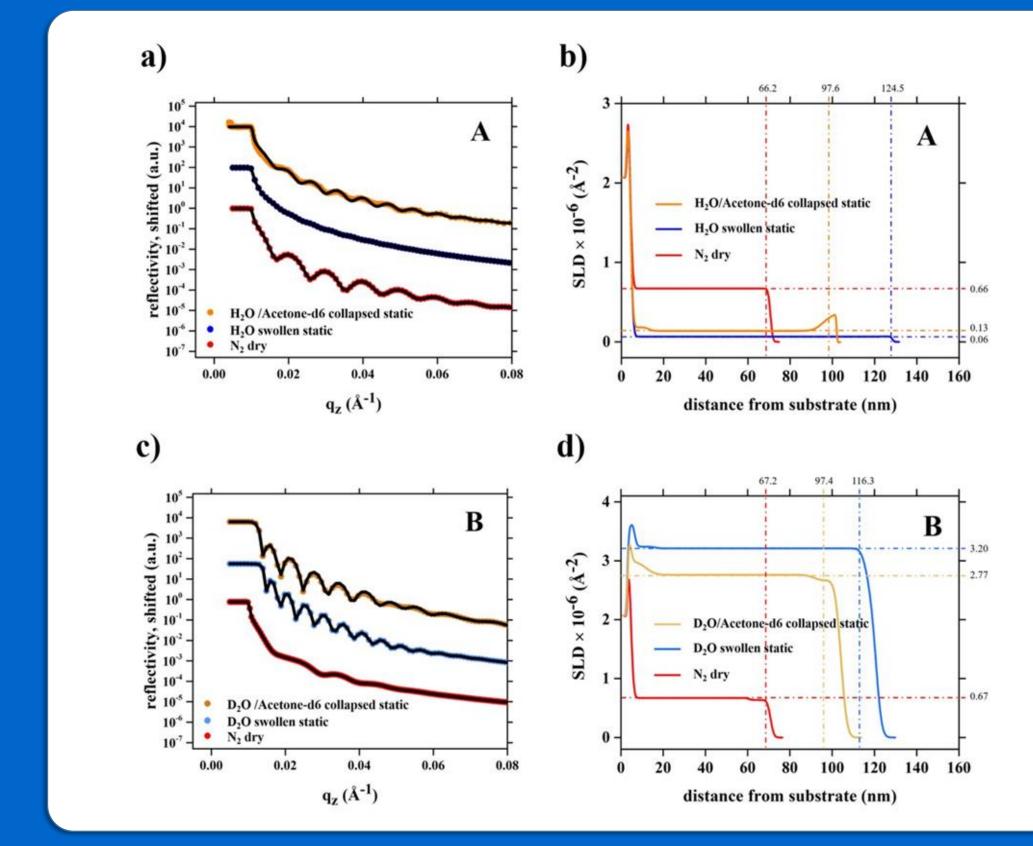
Block Copolymer **PSBP-***b***-PNIPMAM**



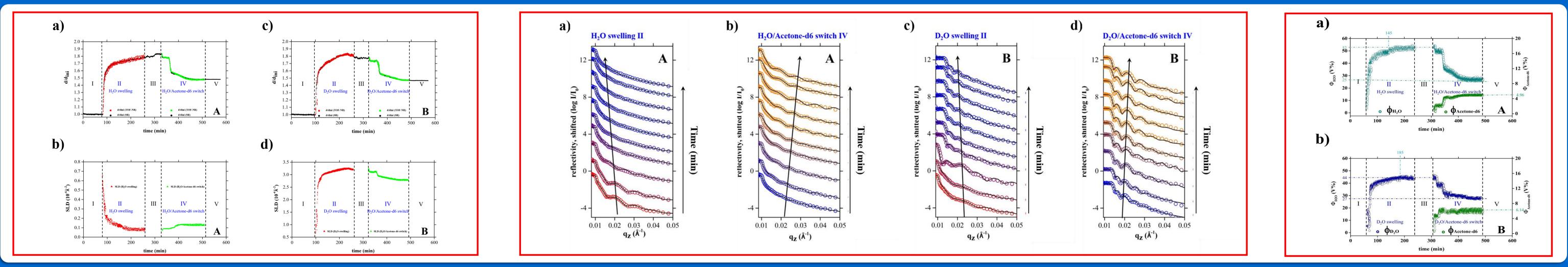
XRR measurement



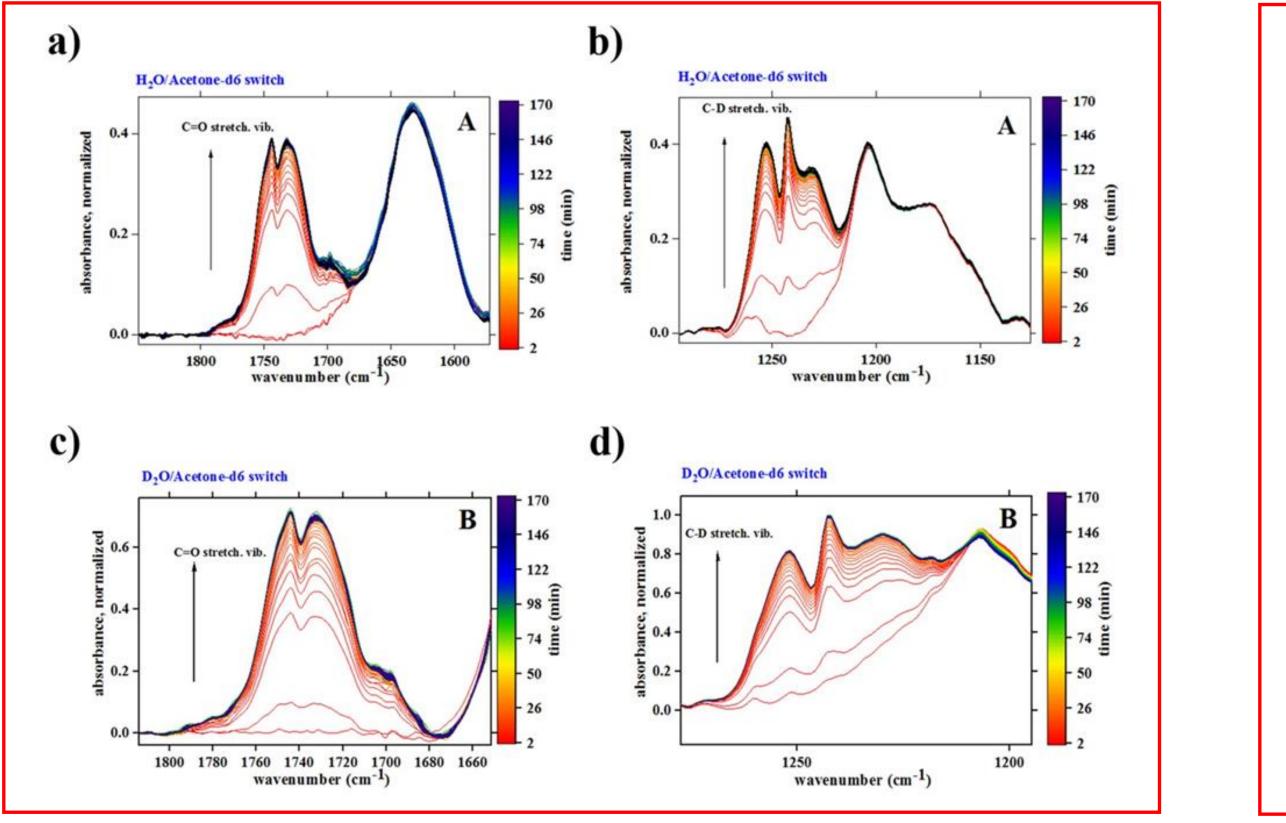
Static ToF-NR measurement

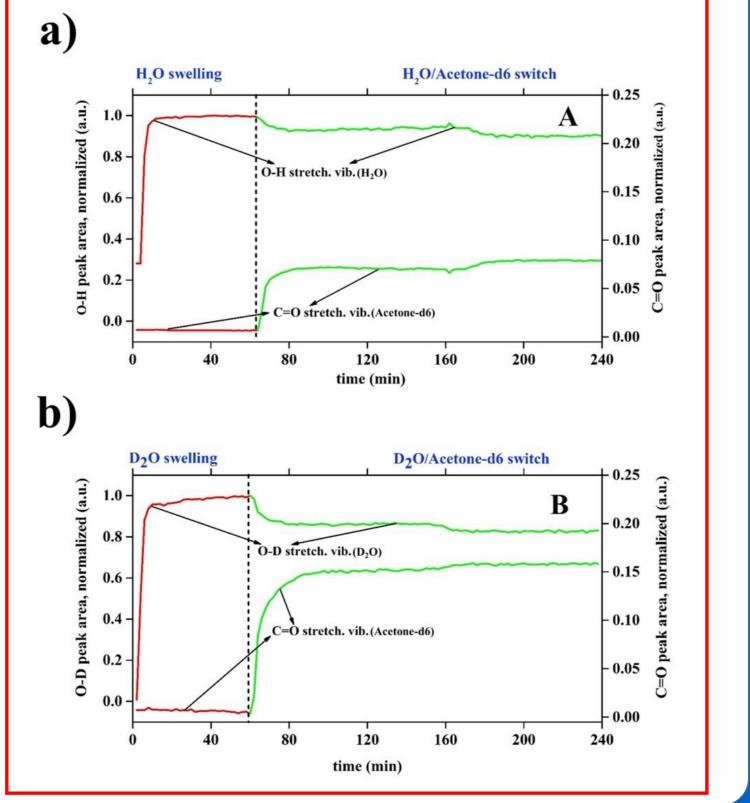


In situ ToF-NR measurement

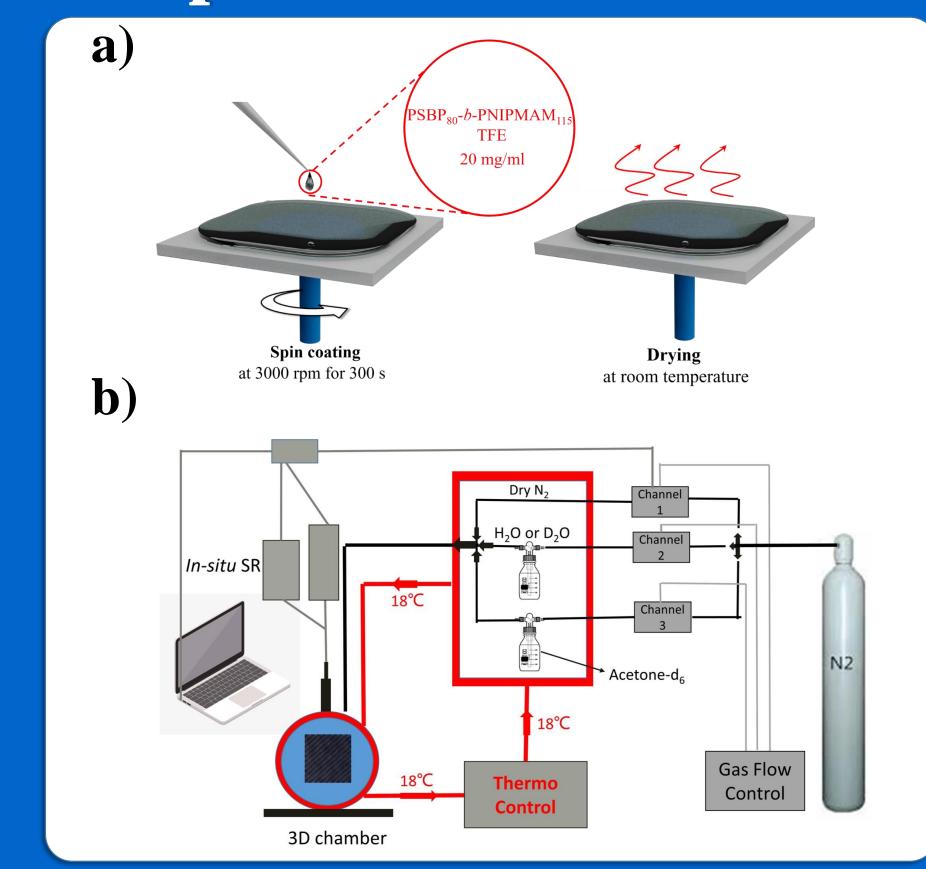


FT-IR spectroscopy





Sample environment



Summary and outlook

- 1. The swelling behavior of $PSBP_{80}$ -*b*-PNIPMAM₁₁₅ thin films in saturated H₂O or D₂O vapors and a subsequent cononsolvency behavior in different mixed water/acetone-d6 vapors with a ratio of 90 %/10 % were investigated.
- 2. The studied DBC achieves three vastly different and stable static thicknesses upon the swelling and co-nonsolvency effect, and the two blocks show a separate co-nonsolvency behavior in the water/acetone-d6 atmosphere.
- 3. The studied DBC thin films become a good candidate in a wider range of promising applications, such as humidity sensors, multifunction switches, controlled release systems, and biopharmaceutical systems involving small amounts of acetone solvent.

