הטכניון - מכון טכנולוגי לישראל

TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY

הפקולטה להנדסה כימית
ע"ש וולפסון
The Wolfson Department of Chemical Engineering

Wolfson Department of Chemical Engineering – Special Seminar
Departmental seminar room (3rd floor), Wolfson Department of Chemical Engineering,
Monday February 11th at 1:30pm

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Self-assembly of block copolymers in solutions and films

In the first part the formation of so-called integral asymmetric isoporous block copolymer membranes will be discussed on the example of polystyrene-block-poly(4-vinylpyridine) in flat sheet and hollow fiber geometry. These membranes are prepared by a solution casting technique, where a block copolymer solution film is immersed into a coagulant. Structural properties in solution will be related to the finally obtained membrane structure.[1-5]

In the second part bulk and solution properties of novel stimuli-responsive block copolymers [6] containing a poly[2-(N-morpholino)ethyl methacrylate] (PMEMA) block [7] will be addressed. Aqueous solutions of narrowly distributed (PMEMA) show a peculiar three-step aggregation behavior upon heating; an effect which has hitherto barely been reported for other polymers. Furthermore, the influence of different anions (salting-out (kosmotropic) and salting-in (chaotropic) along the Hofmeister series) on the solubility properties is presented.[7]

Finally poly[N-acryloylpiperidine-random-N-acryloylpyrrolidine] (poly[APi-r-APy]) as a novel thermoresponsive copolymer will be introduced. One of its attractive features is that the lower critical solution temperature (LCST) in aqueous solution can be easily adjusted between almost 0°C to approx. 50°C. A second 'good' solvent influences the thermoresponsiveness of the system as will be shown on solvent mixtures of water with different alcohols. The chemical structure of the alcohols was systematically varied, leading to either upwards or downwards shifts of the cloud point. The results are discussed in terms of polymer–additive as well as additive–water interactions and help to gain a more detailed understanding of water interactions with amphiphilic additives and, hence, of cononsolvency phenomena.[8] Finally the possibility to take advantage of a cosolvency effect will be shown in the example a polymerization induced self-assembly (PISA) of a thermoresponsive block copolymer.[9]

[1] Abetz, Macromol. Rapid Commun. 2015, 36, 10; [2] Radjabian et al., ACS Appl. Mater. Interfaces 2017, 9, 31224; [3] Dami et al., Polymer 2017, 126, 376; [4] Rajabian et al., Polymer 2013, 54, 1803-1812.; 2014, 55, 2986; [5] Sankhala et al., Adv. Mater. Interfaces 2017, 4, 1600991; [6] Eggers et al., Polymer 2016, 107, 357; [7] Eggers et al., Macromol. Chem. Phys. 2016, 217, 735; [8] Lucht et al., Polym. Chem. 2017, 8, 1196; [9] Eggers et al., Polymers, 2017, 9, 668.

Refreshments will be served at 1:15pm