

Thermo-responsive Draw Solute for Forward Osmosis; Zwitterionic Homopolymer showing Upper Critical Solution Temperature Characteristics

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We synthesized the zwitterionic homopolymer polysulfobetaine (PBET), which has upper critical solution temperature characteristics, via free radical polymerization in order to investigate its applicability as a draw solute for the forward osmosis (FO) process. The upper critical solution temperature (UCST) characteristics of the monomer BET were not confirmed, while the UCST of PBET was observed to be approximately 41 °C. This result suggests that PBET can be simply recovered from aqueous solutions by cooling them to below the UCST. In an active layer facing feed solution (AL-FS) system containing 20 wt% PBET at a temperature of 50 °C, the water flux and reverse salt flux of PBET were observed to be approximately 3.22 LMH and 0.36 gMH, respectively. To conclude, we investigated the applicability of homopolymers having UCST characteristics as draw solutes for the FO process for the first time. This study provides for in-depth understanding of new methods of proceeding draw solutes and can provide inspiration for the potential design and synthesis of thermo-responsive organic materials.