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Synthesis of amphiphilic PEG-b-PSf-b-PEG triblock copolymers and its application in separation membranes

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Recently, ultrafiltration (UF) membranes have faced great challenges including the fine control of membrane surfaces for high filtration performances and antifouling properties in treating complex solution systems. Here, a particular type of amphiphilic block copolymer polyethylene glycol-block-polysulfone-block-polyethylene glycol (PEG-b-PSf-b-PEG) was synthesized through one-pot step-growth polymerization with mPEG [monomethylpoly(ethylene glycol)] as two ends to achieve the mobility of hydrophilic polymer chains. Without any other polymers or additives involved, the PEG-b-PSf-b-PEG triblock copolymer UF membrane was fabricated through the non solvent induced phase separation (NIPS) method. The surface properties and filtration performances of UF membranes were tailored through the self-assembly of PEG-b-PSf-b-PEG triblock copolymers combining the thermal and solvent annealing treatments in water at 90°C for 16 h. The annealed PEG-b-PSf-b-PEG triblock copolymer membrane significantly enhanced its water flux resulting from the increased mean pore size with the improved porosity as well as the decreased skin layer thickness, upon annealing. More importantly, the PEG-b-PSf-b-PEG triblock copolymer membrane surface turned from hydrophobic to hydrophilic upon annealing with the PEG enrichment on the surface and exhibited improved protein antifouling performances. Our research opens a new avenue to tailor the membrane structure and surface properties by self-assembly of amphiphilic block copolymers upon thermal and solvent annealing treatments.

Biography

Ning Wang is an Assistant Professor at the Yantai Coastal Zone Research Institute of the Chinese Academy of Sciences. He graduated from the Institute of Chemistry, Chinese Academy of Sciences in 2012 with a PhD in Polymer Chemistry and Polymer Physics. He has been engaged in synthesis of novel polymer and nanocomposites and their application in wastewater treatment for many years, including synthesis of novel amphiphilic block copolymer polyethylene glycol-block-polysulfone-block-polyethylene glycol and wastewater treatment based on nanocomposites such as clay supporting Au, Ag and Cu with dopamine chemistry, etc. other fields. He has published more than 30 SCI papers.

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