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# *Approaches to Prepare PVDF Based Hollow Fiber Membranes for Clean Water*

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Polyvinylidene fluoride (PVDF) hollow fiber Microfiltration (MF) membranes were firstly prepared via thermally induced phase-separation (TIPS) method, where diphenyl carbonate (DPC) and diphenyl ketone (DPK) were used as primary diluents. The liquid - liquid phaseseparation phenomena were found and the monotectic points of PVDF/DPC and PVDF/DPK systems appeared at PVDF concentration approximately 30 and 56 %(wt), respectively. The effects of polymer concentration and quenching temperature on the pore structure, porosity and tensile strength of the membranes were also investigated. Secondly a novel HF PVDF based ultrafiltration (UF) membrane was prepared by forming a thick poly(sulfobetaine) (PSB) layer on the hollow fiber PVDF MF membrane. The PVDF based polySB UF membrane has sieving effects with the MWCO of 5.2 µm and 85~105 kDa, respectively, which contributed to the greatly improved hydrophilicity, membrane strength and thermal property. The another way to prepare a HF PVDF based UF membrane was forming a thick polyethersulfone (PES) outer layer by using the non-solvent induced phase separation (NIPS) method. Thirdly Nanoparticles (NPs) reinforced thin-film composite (TFC) membranes containing a range of 50~200 nm nanoparticles [MWCNTs, GOs, LTA zeolites] in a polypiperazine-amide (PA) thin film layer were synthesized via sequential interfacial polymerization on PES/PVDF hollow fiber substrates. The hydrophilization process of the NPs was conducted to ensure the homogenous dispersion in the aqueous phase containing piperazine prior to the interfacial reaction, and their morphologies in the PA layer were confirmed by FT-IR spectroscopy, SEM, EDX, XPS and TEM. For all the NPs reinforced TFC membranes, the water flux increased significantly. The separation performances of the monovalent and divalent ions of NaCl/Na2SO4 solutions were conducted. Finally a novel thin film nanocomposite (TFN) hollow fiber membrane was fabricated comprising the sulfobetaine polymer functionalized multiwalled carbon nanotubes (ZCNT). The TFN (ZCNT) hollow fiber membrane had much narrower pore sizes than TFN (CNT) hollow fiber membranes, which was due to the grafting PSB layer at the end of the open-mouth-ended CNTs. By increasing the chain length of PSB, the TFN (ZCNT) hollow fiber membrane showed simultaneously improved water permeability and separation capacity of 1 WFC 13 dextrans and electrolytes