Surface-concentrated chitosan-doped MIL-100(Fe) nanofillers containing PVDF composites for enhanced antibacterial activity

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Membrane biofouling is a major bottleneck for the membrane-based wastewater treatment since it significantly reduces water flux. Here, surface-concentrated MIL-100(Fe)/chitosan (MIL100-CS)-embedded polyvinylidene fluoride (PVDF) composite membranes (i.e., PVDF-S/MIL100-CS) were successfully fabricated by the newly developed fabrication method, a so-called solvent-assisted nanoparticle embedding (SANE). The PVDF/MIL100-CS microfiltration (MF) composite membranes acquired by SANE exhibited the higher antibacterial activity and the substantially enhanced biofouling resistance for E. coli cells than those of the pristine PVDF-S due to the surface-selective arrangement of MIL100-CS fillers. The live/dead test for antibacterial activities with E. coli cells further confirmed the enhanced suppression of the biofouling resistance in the PVDF-S/MIL100-CS composite membranes relative to that of PVDF-S. Our current study offers a new platform for fabricating MF composite membranes with enhanced antibacterial activity and biofouling resistance.