Nanofiltration Membrane with A Mussel-Inspired Interlayer for Improved Permeation Performance

11529019 Xi Yang, Yong Du, Xi Zhang, Ai He, Zhi-Kang Xu*

Abstract:
A mussel-inspired interlayer of polydopamine (PDA)/poly(ethyleneimine) (PEI) is co-deposited on the ultrafiltration substrate to tune the interfacial polymerization for the preparation of nanofiltration membranes (NFMs). The solution height increases with the PDA/PEI co-deposition time from 45 min to 135 min due to the capillary effect of the substrate pores. The prepared TFC NFMs are characterized with thin and smooth polyamide selective layers by ATR/IR, XPS, FESEM, AFM, zeta potential and water contact angle measurements. Their water permeation flux measured in a cross-flow process increases to two times as compared with those TFC NFMs without the mussel-inspired interlayer and show a high rejection of 97% to Na$_2$SO$_4$.

Introduction

Our results show that this hydrophilic interlayer can regulate the adsorption/diffusion of diamine monomer for the interfacial polymerization, and the resulted membrane structures with the nanofiltration performances. Moreover, the TFC NFMs with the PDA/PEI hydrophilic interlayer achieve the thin and smooth polyamide selective layer. The versatility of this mussel-inspired interlayer could potentially offer the new pathway for a wide range of TFC NFMs preparation and applications.

Conclusions

Acknowledgement
The authors thank the financial support to this work by the National Natural Science Foundation of China (Grant No. 21534009) and the Open Research Fund Program of Collaborative Innovation Center of Membrane Separation and Water Treatment of Zhejiang Province (Grant No. 2016ZD04).

References