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Enhancing the forward osmosis performance via the mesoporous silica hollow spheres assisted fast adsorption-diffusion process

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Abstract

A novel thin film composite (TFC)-type forward osmosis (FO) membrane was prepared via the anchoring of mesoporous silica hollow spheres (MSHS) in the polyamide active layer. Compared to the unmodified FO membrane, the addition of MSHS significantly increased the separation flux by more than 80% and inhibited the trade-off phenomenon of the prepared FO membrane. It was believed that the addition of MSHS introduced a rapid adsorption-diffusion permeation process, which optimized the slow dissolution-diffusion separation process of the dense active layer and improved the separation efficiency of the TFC-type FO membranes. In addition, the prepared FO membrane exhibited high separation selectivity for heavy metal ions with the rejection ratio over 99.3%, which provided a positive reference for the treatment of heavy metal ion wastewaters by FO membranes.

Keywords: Functional; diffusion; thin films; porous materials

1. Introduction

Forward osmosis (FO) membrane has been a research focus in the field of separation membrane due to the expected separation performance in desalination, sewage treatment and pure water production [1,2]. However, the disadvantages of low separation efficiency and severe concentration

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