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Novel high boron removal polyamide reverse osmosis membranes

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Abstract

Novel high boron removal thin film composite (TFC) membranes with semi-interpenetrating networks were fabricated by interfacial polymerization (IP) with m-phenylenediamine (MPD) and 1,3,5-benzenetricarbonyl trichloride (TMC). The polyisobutylene (PIB) was added to the organic phase prior to IP. The membranes were characterized by attenuated total reflectance Fourier transform infrared spectrometry (ATR-FTIR), X-ray photoelectron spectroscopy (XPS), field emission scanning electron microscopy (FE-SEM), atomic force microscopy (AFM) and the zeta potential and contact angle analysis. The results of this study demonstrate that the novel TFC membrane exhibited superior separation performance at a relatively low concentration of PIB (0.30%, m/v). As the concentration of the interpenetrating PIB in the membrane increased, the membrane morphology changed distinctly. Furthermore, the permeability coefficient of boron decreased from 20.84 to 3.26, and the rejection of boron increased from 81.36% to 93.12%.

Keywords: Reverse osmosis; semi-interpenetrating; boron removal; polyisobutylene

1. Introduction

Reverse osmosis (RO) is a novel membrane separation technology that emerged in the 1960s. In the context of the global water shortage and increasing water pollution, RO technology exhibits low