Changes in characteristics of polyamide reverse osmosis membrane due to chlorine attack

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ABSTRACT

In reverse osmosis (RO) process, chlorine is used in a pretreatment process to inhibit biofouling, however, its residual should be eliminated by using sodium bisulfite (SBS) before the RO process because polyamide (PA) RO membrane is damaged by free chlorine contact. In a field application, there always exists a risk that SBS injection pump is out of order so that PA membrane may be damaged by the residual chlorine. The objective of this work is to quantitatively investigate the effect of residual chlorine attack on the water flux and salt rejection of PA membrane. Lab-scale RO tests were performed to see changes in water flux and salt rejection by adding sodium hypochlorite and SBS. With a small concentration of residual chlorine and pH of 6–7, chlorination of aromatic rings in PA membrane induced a sharp flux decline at the beginning of the chlorination followed by a gradual decline. The additional exposure of chlorinated PA membrane to a high concentration (300 ppm) of residual chlorine induces the increase of flux and decrease of salt rejection. Dechlorination makes it possible to recover the declined flux although the complete recovery of flux is not possible.

Keywords: Reverse osmosis process; Chlorine; Polyamide; Chlorination of aromatic rings; Dechlorination

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