

Removal of PFOA by hybrid membrane filtration using PAC and hydrotalcite

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ABSTRACT

Perfluorooctanoic acid (PFOA) is one of the major perfluorinated compounds (PFCs) contaminating global water sources. Considering the difficulty faced in current treatment for removal of concentrated PFOA in industrial wastewater, there is a need to develop an effective treatment system. This study focused on the development of an adsorption-based hybrid membrane technology to remove high concentration of PFOA from industrial sources. The most effective process was the combination of hydrotalcite and nanofiltration (NF), which showed a 95% removal, without adverse effect on flux reduction as compared to direct membrane filtration. NF alone removed varying PFOA concentrations in the range of only 60–85% and severe flux reduction was observed at high PFOA concentrations. Due to the dense layer of hydrotalcite which formed on the membrane's surface, membrane rejection was increased by 30% in the hydrotalcite hybrid NF system. Moreover, significant increase in permeate flux was observed in powder activated carbon (PAC) hybrid membrane process, although removal efficiency was decreased as compared to direct membrane filtration. In conclusion, the hydrotalcite-PAC hybrid membrane process showed effective removal of high concentrations of PFOA bringing about: a) effective adsorption with adsorbent; b) enhanced membrane rejection by adsorbent layer; and c) enhanced permeate flux by adsorbent.

Keywords: PFOA; Hybrid process; Nanofiltration; Ultrafiltration; Hydrotalcite; Powdered activated carbon

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