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Performance of NF/RO process for indirect potable reuse: interactions between micropollutants, micro-organisms and real MBR permeate

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ABSTRACT

Micropollutants and micro-organisms are major concerns for indirect potable reuse of municipal wastewater. In this study, the retention of pesticides, polycyclic aromatic hydrocarbons (PAHs), metals and micro-organisms in real membrane bioreactor (MBR) permeate matrix and in ultrapure water matrix by nanofiltration (NF) or reverse osmosis (RO) process, and the impact of their retention on NF/RO membrane fouling, were investigated. NF 90 and ESPA2 membranes were chosen for this work. The RO membrane showed high retention for most of the molecules tested, whereas the NF membrane exhibited some variation in the retention of pesticides. The retention of pesticides and metals was enhanced by their interactions with the MBR permeate, while an almost complete retention of PAHs and micro-organisms was observed in both matrices. The presence of PAHs in the MBR permeate increased the permeability of the RO membrane, whereas no such effect was observed for pesticides, metals and micro-organisms. Also, phage leakage was detected when the NF/RO membrane was contaminated by bacteria, which may have caused a slight membrane damage. Pesticide rejection was found to be related to LogKow and molecular weight in ultrapure water at low concentrations (μg/L level).

Keywords: Micropollutants; Micro-organisms; Nanofiltration; Reverse osmosis; MBR permeate; Indirect potable reuse

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