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Removal of pesticides and polycyclic aromatic hydrocarbons from different drinking water sources by nanofiltration

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ABSTRACT

This study evaluates the efficiency of nanofiltration to remove pesticides and polycyclic aromatic hydrocarbons (PAHs) from drinking water sources with different compositions (groundwater, spring water, surface water, and surface water after sedimentation) as well as the main mechanisms governing the rejection of these compounds. All the polycyclic aromatic hydrocarbons compounds were highly removed from the different water matrices due to strong hydrophobic interactions between these compounds and the membrane. Lower and variable rejections were obtained for pesticides in different natural water matrices. Atrazine rejection was found to be independent from the water matrix composition and appears to be influenced by a combined effect of hydrophobic and coulombic interactions with the membrane as well as size exclusion. The rejection of alachlor may be related to the composition of the water in terms of ionic content. The ions present in the water may have a "shielding" effect on the solute and membrane surface charge, reducing the repulsive electrostatic interactions and therefore, decreasing the rejection of alachlor in the matrices with higher alkalinity. The main mechanism of pentachlorophenol rejection is the hydrophobic interaction with the membrane, although electrostatic interactions cannot be excluded because pentachlorophenol is deprotonated at the pH of the water matrices. This work clearly shows that the composition of the water matrices may highly influence the efficiency of the nanofiltration process in terms of the removal of the micropollutants.

Keywords: Pesticides; Polycyclic aromatic hydrocarbons; Nanofiltration; Natural water sources; Water treatment

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