

Removal of poly-and perfluorinated compounds using combined process of magnetic activated carbon and ceramic nanofiltration

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Abstract:

Recently, poly-and perfluorinated compounds (PFCs) are widely used in many industries as coating materials, surfactant, lubricant and semiconductor industries. In the case of PFCs, due to their stable and non-degradable characteristics under environmental conditions, they broadly distributed and concentrated in livings. PFCs are harmful substances that cause cancer, pregnancy disorders, heart disease, and hormonal disorders in humans. It has also reported to be resistance to photolysis, biodegradation and hydrolysis. Due to these characteristics, the removal efficiency of PFCs in the conventional process is less than 50%. In this study, combination of magnetic activated carbon (MAC) and ceramic nanofiltration (CNF) was tested for reduction of the PFCs discharged to the water system. While conventional ACs such as granular activated carbon (GAC) and powdered activated carbon (PAC) cannot be reused, MAC-CNF can effectively remove the PFCs and MAC can be regenerated after absorbing the PFCs. Adsorption performance is depending on the chain length of the PFCs, and some PFCs such as per-and polyfluoroalkyl substances (PFASs) are difficult to be adsorbed. In the combination process, CNF not only removes the PFCs that cannot be removed in the adsorption process and remove the residual contaminant, but also prevents MAC from being released into the water system. CNF has thermal and chemical resistance so it can control the fouling more effectively than polymeric membranes. Therefore, the MAC-CNF process is effective treatment option to remove PFCs and further increases the water quality.

Keywords: Poly-and perfluorinated compounds, Magnetic activated carbon, Ceramic nanofiltration membrane