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Treatment of nanofiltration membrane concentrates: Organic micropollutant and NOM removal

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ABSTRACT

In the nanofiltration (NF) membrane systems utilised for river water treatment for drinking water production purposes 15–25 % of the feed is rejected by the membrane as the concentrate. It contains natural and synthetic organic matter (COD ca. 30 mg/L) and its composition may vary with raw water quality, membrane pre-treatment and NF membrane cut-off. This study aims to achieve complete elimination of pesticides and the elimination of 60% of the natural organic matter (NOM) retained during nanofi ltration step. The investigation included testing conventional water treatment techniques—adsorption, coagulation, ozonation—and the combination of ozonation and adsorption processes. Eight pesticides detected most commonly in French surface waters were selected as model micropollutants: atrazine, sulcotrione, bentazone, isoproturon, diuron, glyphosate, amitrole and acetochlore. Simultaneous combination of ozonation and powdered activated carbon (PAC) adsorption proved to be an efficient method for the elimination of the polar and ozone resistant pesticides at low carbon and ozone concentrations. This combination also achieved faster NOM removal than PAC adsorption only. It was observed that even with the use of high PAC concentrations, addition of low ozone dosages were necessary to degrade highly polar pesticides together with the NOM. No significant modification of the carbon activity and surface properties was observed at low ozone concentration levels, ca. 3 mg/L.

Keywords: Concentrate; Pesticide; Organic matter; Nanofiltration; Adsorption; Ozonation

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