



## Analyses of molecular weight distribution of organic matters with pre-oxidation and PAC–UF pretreatment before seawater reverse osmosis

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### ABSTRACT

The water source of Shanghai, China is located in the lower Yantze River close to the estuary of East Sea. Due to the decreasing of upriver water in recent years, the water supply is facing with the challenge of salt tide from East Sea. Before reverse osmosis, powdered activated carbon–ultrafiltration (PAC–UF) pretreatment is employed to remove organic matters and turbidity to prevent the rapid fouling of reverse osmosis membrane. The purpose of this study was to analyze molecular weight (MW) distribution and conversion in oxidation and PAC–UF pretreatment processes and to find out the relationship between dissolved organic carbon (DOC) removal, oxidant dosage and PAC–UF treatment. The results showed that by conventional water treatment, chlorination (Cl<sub>2</sub>) and potassium permanganate (KMnO<sub>4</sub>), pre-ozonation can reduce DOC concentration for larger MW fractions (>30 k, 10–30 k, and 3 k–10 k Dalton (Da.)), however, at the same time, increased smaller MW fraction. PAC adsorption was regarded as the effective way to remove DOC in smaller MW fractions. Quantitative data were statistically explained. In combination of postozonation, PAC–UF can eliminate large amount of DOC in <1 kDa. MW fraction. It is observed that the treatment process has a better effect at removing trihalomethane formation potential (THMFP) than haloacetic acid formation potential (HAAFP), though HAAFP concentration is reduced as well. In finished water, larger MW fraction has higher HAA potential reactivity, and the part with lower than 1 k and 1 k–3 kDa. leads to trihalomethanes (THMs) formation potential. In conclusion, PAC–UF in assistant of pre-oxidation was able to remove majority of organic matters to prevent the rapid fouling of reverse osmosis membrane.

*Keywords:* Pre-oxidation; Molecular weight; Membrane; Organic matters

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