REMOVAL OF DISINFECTION BY-PRODUCT PRECURSORS BY ACTIVATED CARBON AND MIEX®

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ABSTRACT

The objective of this research was to investigate NOM removal with activated carbon and MIEX®. Hydrophilic (HPI), hydrophobic (HPO), and transphilic (TPI) NOM was fractionated and subsequent DBP formation from these fractions was studied.

Several new adsorptive materials (greensand, carbon nanotubes, iron impregnated activated carbon) were tested for DBP reduction potential. Reductions by the materials were poor and therefore the materials were not investigated further.

Activated carbons, although similar in structure, perform differently from each other. Aqua Nuchar® and Hawkins Sabre Series® had greater than 30% difference in TTHM FP reduction under the same test conditions. None of the activated carbons investigated were found to have potential for brominated DBP precursor removal.

When MIEX® (magnetic ion exchange) was compared to activated carbon with respect to NOM fraction removal, it was found that MIEX® removed more of the HPI and TPI fractions. This was represented well in DBP FP reductions specifically derived from reactions with NOM in these fractions. In particular, MIEX® decreased NOM in the HPI fraction only 10% more than activated carbon but decreased TTHM FP 34% greater than activated carbon. This suggests that MIEX® preferentially removes DBP precursors to a greater extent than activated carbon. MIEX® was also found to decrease formation of brominated DBPs.

SUVA, UV254, DOC, and chlorine demand were all investigated as surrogate parameters for DBPs. UV254 was found to correlate best with DBP formation with $0.56 < R^2 < 0.80$. UV254 absorbed by HPO NOM was found to correlate best with TTHM FP ($R^2=0.88$) with HPI being...
poorly correlated ($R^2=0.20$). THMs resulting from reactions with HPI NOM accounted for between 40% and 55% of THMs from all fractions.