Separation of Halo Acetic Acids by Ion Exclusion

Most natural waters contain natural organic matter (NOM), which is primarily composed of humic and fulvic acids. Natural waters are used both as potable and non-potable sources and both need to be disinfected with an oxidant to deactivate pathogens from either use. The disinfection of NOM with an oxidant produces disinfection by-products (DBP). The disinfection of NOM can be achieved through the use of various oxidation sources, such as: UV, ozone, chlorine, or chloramination. Depending on the oxidant and the source water, various halo DBPs can be formed.[1] Each source generates multiple DBP's. One of the main components to the nearly 600 identified DBP's are haloacetic acids (HAA) which have been detected in our ecosystem and affect overall human health. As utility companies utilize more influent waters containing higher salinity or desalinated sea/brackish groundwater, a growing concern has mounted for HAA's. The higher concentrations of bromide and iodide converted in these waters change the speciation of DBP's toward their brominated and iodinated analogues rather than their more recognized chlorinated species.[2,3] These species have been documented as more toxic than the chlorinated analogs and are not routinely tested for by regulatory administrations.[4]

NOM in general contains healing properties, however, oxidation of NOM generates toxicity when the HAA's react with themselves to form halocitric acids. When ingested, halocitric acids bind calcium in the citric acid cycle. The sequestered calcium leads to hypocalcemia through the inhibition of the citric acid cycle. Accurate detection of HAA's is paramount for the prevention of over oxidation, while still managing enough water sanitation to eliminate water borne pathogens. As such, a need for a fast and repeatable method for the quantification of HAA's is of great demand for sanitation departments to accurately and quickly determine if their eluent is environmentally friendly. This method isolates fluoro, chloro, bromo, and iodoacetic acids from water samples which highlights the effectiveness and robustness of the Hamilton PRP-X300, 7 µm ion exclusion column (150 x 4.1 mm). The simple isocratic method utilizes a mobile phase of 3 mN H2SO4 and acetonitrile (95:5) to make reproducibility fast and easy.

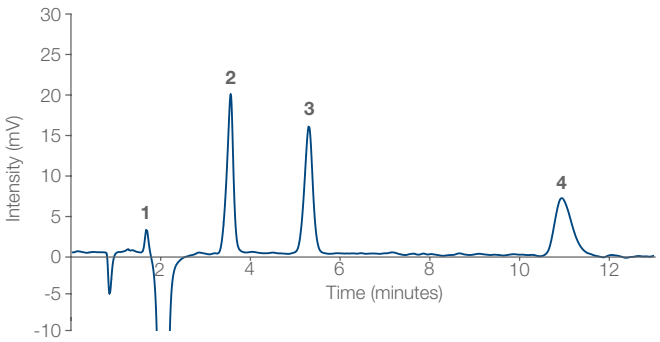
1) *Li, X.-F., M, W.A. Environ. Sci. Technol. 2018, 52, 1681–1689.*
2) *Zhao, Y.; Qin, F.; Boyd, J. M.; Anichina, J.; Li, X.-F. Anal. Chem. 2010, 82 (11), 4599–4605.*
3) *Hua, G.; Reckhow, D. A.; Kim, J. Environ. Sci. Technol. 2006, 40 (9), 3050–3056.*
4) *Wagner, E. D.; Plewa, M. J. J. Environ. Sci. 2017, 58, 64–76.*

Column Information

Packing Material	Dimensions	P/N
PRP-X300 (7 µm)	150 x 4.1 mm	79464

Chromatographic Conditions

Gradient	Isocratic
Temperature	Ambient
Injection Volume	20 µL
Detection	Refractive Index
Eluent A	Sulfuric Acid
Eluent A Conc	3.0 mN
Eluent B	Acetonitrile
Flow Rate	1.0 mL/min
Mobile Phase	95:5



Compounds:
1: Fluoroacetic acid
2: Chloroacetic acid
3: Bromoacetic acid
4: Iodoacetic acid

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