

CHEMISTRY SEMINAR

“Expanding The Use Of Membrane Based Methods For Measuring Drinking Water Disinfection ByProducts”

MEGGAN LARSON

CHEMISTRY DEPARTMENT
THE U. OF MEMPHIS
(SCSU ALUMNA)



Wednesday, Nov. 24

12:00 p.m.

WSB-122

Abstract:

Water chlorination is the great public health success of the 20th century. Unfortunately, the formation of chlorinated disinfection by-products (DBPs), such as trihalomethanes (THMs) and haloacetic acids (HAAs), has somewhat tainted its reputation. The United States Environmental Protection Agency (USEPA) has set maximum contaminant levels (MCL) for these DBPs due to possible health concerns. The MCL for Total THM4 and Total HAA5 are 0.080 mg/L and 0.060 mg/L, respectively. USEPA methods 524.2 and 552.3 work very well for quarterly compliance monitoring; however the two methods were not designed for the high sample volume experienced when conducting on-line monitoring studies directly from distribution systems. Utilities that are having problems meeting current regulations can wait 3 to 6 weeks for contract lab analysis of THMs and HAAs. They need simple and relatively inexpensive methods to allow them to monitor these DBPs.

A capillary membrane sampling-gas chromatography-mass spectrometry (CMS-GC-MS) method was developed for analysis of THM4 in drinking water. This method uses a capillary membrane sampling device (CMS), which has a “tube-within-a-tube” design whereby silicone membrane tubing is inserted through Tefzel tubing. During sampling, drinking water flows through the silicone membrane tubing allowing THM4 to permeate through the membrane wall and into a gas stream. The gas stream laden with THM4 flows to an adsorbent trap, preconcentrating the THM4, and is coupled to an injection valve. The trap is rapidly heated, thus desorbing the THM4 for analysis using GC-MS. The use of MS allows for characterization of potential interfering compounds. This type of instrument will be used to do prescreening of water samples in order to get an accurate estimate of the THM4 species and identify potential interfering species which may cross the CMS membrane.

More recently, we have developed a portable, semi-automated field kit with all of the necessary equipment contained in a rugged carrying case for Total THM and Total HAA analysis. This kit also uses the capillary membrane sampling device (CMS) to separate Total THM species from Total HAA species. Once separated, the Total THMs and Total HAAs are reacted with base and nicotinamide to form a fluorescent product which is analyzed using a handheld fluorimeter in near real-time. This field kit will give the smaller utilities access to the same THM and HAA values that the larger utilities currently have access to despite their size and budget.

In this presentation an overview of these methods, which include a relative high-tech MS method and a relatively low tech field kit, will be presented including how they are developed and how they are evaluated. The results of detailed method detection limits, accuracy, and precision studies for each method will be presented as well as a discussion of the status of each method in this on-going research.

MS. LARSON WILL MEET WITH STUDENTS AT 1:00 P.M. IN WSB-344