

Organomercury Compound Determination from Microbiologically Mediated CUB Samples

David J. Hassett, Erick J. Zacher, and Loreal V. Heebink

University of North Dakota, Energy & Environmental Research Center, 15 North 23rd Street, PO Box 9018, Grand Forks, ND 58202

KEYWORDS: mercury, speciation, organomercury compounds

ABSTRACT

Mercury offgassing from coal utilization by-products (CCBs) is of great interest and concern, especially in applications such as agricultural use and soil stabilization. In these cases, microbiologically mediated mercury release could result from methylation reactions.

Experiments at the Energy & Environmental Research Center (EERC) were conducted in which bacterial cultures were grown in the presence of fly ash known to have relatively high mercury concentrations. Both organomercury and elemental mercury offgassing were determined. More recently, solid-phase microextraction (SPME) has been used for the determination of organomercury species in the liquid fraction of the microbiological experiments.

The EERC has developed a method of sampling gas streams and headspace gas for determination of dimethyl mercury and methyl mercuric chloride. A derivitization method using sodium tetraethyl, propyl, or phenyl borate is carried out prior to capture with a SPME fiber coated with polydimethylsiloxane. Detection limits on the order of <25 picograms have been achieved, and lower detection limits are possible with further refinements of the method. Organomercury species have been detected in microbiologically mediated experiments using coal fly ash. Anaerobic conditions promoted greater levels of organomercury generation than aerobic conditions.

Submitted for consideration in the 2005 World of Coal Ash, April 11–15, 2005, Lexington, Kentucky, USA.