

Development of Methods to Collect and Analyze Gasoline Range (C5 to C10) Hydrocarbons from Seabed Sediments

Abrams, Michael A.¹, Eva Francu², Nick Dahdah¹ (1) University of Utah Energy & Geoscience Institute, Salt Lake City, UT (2) Czech Geological Survey, Brno, Czech Republic

Gasoline range hydrocarbons (C5 to C10) are usually associated with petroleum generation. Up to present few surface geochemical surveys have attempted to evaluate gasoline range hydrocarbons in near-surface marine sediments. The key to sampling these light hydrocarbons in marine sediments is to capture and analyze them with minimum loss or fractionation using a solvent-less method. In this study, a Solid Phase MicroExtraction (SPME) method was tested for this purpose. SPME was initially developed for analyses of volatile aromatic hydrocarbons (BTEX) using fused silica fiber coated with PDMS (polydimethylsiloxane liquid) immersed to aqueous phase. Subsequent investigations showed that much better results were reached if the fiber was exposed to a headspace above the solution (HSPME - Headspace Solid Phase MicroExtraction).

The sediment seepage HSPME extraction method is based on the condition that phase/composition equilibrium is reached between sediment/saline water mix, disrupter headspace, and SPME fiber coated with sorbent. In our experiments, we evaluated the effectiveness of HSPME to detect and measure low concentrations of migrated crude oil in marine sediments. The following optimum laboratory procedure for HSPME gasoline monitoring was established: collect sample in sealed disrupter chamber, use water bath to keep stable laboratory temperature, NaCl saturated solution to help aromatic compound move out of the solution to vapor phase, and sufficient time to reach equilibrium. The results show that HSPME is very sensitive with detection limit of approximately 6 ppm. HSPME proved to be suitable to reveal the natural background and microseepage level of gasoline hydrocarbons in marine sediments.