POSTER ABSTRACT

Detection of Explosives using a Portable SPME/GC-Cylindrical Ion Trap Mass Spec

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Long term monitoring at Department of Defense sites is required to demonstrate successful remediation and regulatory compliance. The monitoring programs are expensive with the majority of the costs related to sampling, shipping, and analysis. Field analytical technologies can reduce monitoring costs compared to fixed laboratories, however the field instruments must produce data that is acceptable for regulatory purposes. The goal of this work is to test a field analytical method for munitions constituents found in ground water at a formerly used Department of Defense site.

A Griffin Analytical Technologies Minotaur 300 cylindrical ion trap (CIT) was used to develop an analytical method for the detection of munitions constituents. The munitions constituents of interest were TNB, RDX, 1,3-DNB, TNT and 2,4-DNT, all known contaminants of the field site. Concentrations of the munitions constituents in the ground water of the site ranged from ~40 ppb to 16 ppm. The CIT was equipped with a Restek RTX-TNT heated gas chromatography capillary column, which allowed for confident identification of the target analytes and separation from interferences. Solid phase micro-extraction (SPME) fibers were chosen to eliminate chemical waste generated in the field and reduce sample volumes.

The method developed on the Minotaur 300 was transferred to the field ruggedized Griffin Analytical Technologies Minotaur 400 mass spectrometer for the field work. Standard low flow sampling was used to collect water from monitoring wells at the site, which was then extracted with SPME fibers and analyzed immediately on the Minotaur 400. Additionally 500 mL samples were transported to our fixed laboratory for analysis by the traditional EPA method for explosives, SW-846 Method 8330. The SPME results taken in the field and run immediately show better detection of the low level constituents, compared to SPME fibers collected in the field and run later in the lab. The GC-MS results taken on the Minotaur 400 will be compared with the results from the traditional EPA method for explosives. With the Minotaur 400 we were able to detect RDX from the solid phase extraction (SPE) by GC-MS, however, we were never able to detect HMX, also a known contaminant of the site.

The results of this work demonstrate successful field analytical technologies for the detection of munitions constituents in ground water. We are currently investigating other techniques for improved detection of RDX and HMX.