

Title: On-site detection of semi-volatile contaminants in water using stir bar sorptive extraction combined with portable gc-ms analysis

Abstract: Rapid, on-site detection is critical for assessing health risks and locating ideal sampling sites. Portable GC-MS allows for the detection and identification of potentially hazardous contaminants in the field, however many sample matrices still require some level of sample preparation prior to analysis. Environmental water sample analysis poses a challenge due to high levels of sediment and debris. Purge and trap or headspace analyses are only useful for the extraction of purgeable, highly volatile organic contaminants (VOCs). The extraction of semi-volatile or non-purgeable contaminants is traditionally performed using liquid extraction with a non-polar organic solvent, but this is not practical in the field. Various types of solid-phase extraction allow for simple extraction and enrichment of non-polar analytes from aqueous matrices. Stir Bar Sorptive Extraction (SBSE) utilizes a layer of polydimethylsiloxane (PDMS) coated on a magnetic stir bar to simultaneously agitate and extract an aqueous sample. The relatively large quantity of the solid phase allows for quantitative extractions of analytes with log Kow values greater than ~2.6. The Stir Bars can then be thermally desorbed directly into a GC-MS system. This study will evaluate the use of SBSE in combination with a rugged, portable GC-MS to detect semi-volatile environmental pollutants (alkylphenols), chemical warfare agent simulants (methyl salicylate, tributyl phosphate), and explosives (TNT, RDX) in water samples. Typical sample volumes are 10 – 20 mL and resulting method detection limits are in the low ng/mL range.