



ANALYSIS OF SULFUR MUSTARD HYDROLYSIS AND OXIDATION PRODUCTS IN SEAWATER AND SEDIMENTS BY CAPILLARY ELECTROPHORESIS

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ABSTRACT

After the World War II large amounts of munitions were dumped in the sea. Sulfur mustard (HD) is the most abundant chemical warfare agent in the dumped munitions. In an aqueous environment, HD rapidly hydrolyses to thiodiglycol (TDG) and then oxidises to TDG sulfoxide (TDGO) and TDG sulfone (TDGOO). The existence of these degradation products is a reliable proof of HD leakage from shells and marine pollution.

Capillary electrophoresis (CE) is not the most common analysis technique for determination of HD degradation products, but it seems to be a very promising due its simplicity and robustness.

In this study a portable and conventional CE system (with conductivity and UV detection, respectively) was applied in the simultaneous determination of TDG, TDGO and TDGOO in seawater and sediments. Determination of TDG, TDGO and TDGOO by CE needs preconditioning steps. A solid-phase extraction, utilizing the carbon aerogel-based adsorbents for sample purification and concentration, and derivatization with phthalic anhydride was used to minimize the values of limit of detection (LOD) [1].

With both instruments (conventional and portable CE) the separation was achieved in less than 15 minutes with LODs reaching ppb levels.

The developed capillary electrophoretic analysis method is very useful for the determination of HD degradation products from seawater and sediments. The portable CE instrument enables the method for in-field use, which provides a fast response when information is urgently needed. Developed analysis method was successfully applied for the analysis of the real samples from the Baltic Sea (Bornholm Deep).

References

- [1] P. Jõul, H. Lees, M. Vaher, E.-G. Kobrin, M. Kaljurand, M. Kuhtinskaja, *Electrophoresis*. **36** (2015) 1202-1207