

DETERMINATION OF PHENOL IN SOILS WITH SOLID PHASE MICROEXTRACTION AND GAS CHROMATOGRAPHY – MASS SPECTROMETRY

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ABSTRACT

Soil contamination is a global environmental pollution problem. Phenolic compounds are highly toxic to human life and listed by the U.S. Environmental Protection Agency (EPA) on the priority list of pollutants and in 76/464/EEC directive of the European Union, related to dangerous substances discharged into aquatic environments. Current standard methods for phenolic compounds analysis in soil are based on Soxhlet extraction, i.e., time consuming and solvent-based method. The objective of this method is to develop method for of phenol in soil with headspace solid phase microextraction and gas chromatography – mass spectrometry (HS)-SPME-GC-MS. SPME methods has some important advantages over conventional extraction techniques due to its ease of use, being rather rapid, portable, and solvent-free.

Keywords: gas chromatography, phenol, soil, solid phase microextraction.

INTRODUCTION

Determination of highly toxic volatile and semivolatile organic pollutants from the soil is one of the most important environmental analyzes in the world. Phenolic compounds are major environmental pollutants which can be present in soils as natural products, derivatives from industrial use as chemical intermediates and from agricultural use as pesticides, bactericides and wood preservatives. The phenolic compounds have at least one aromatic ring with one or more hydroxyl groups. They are applied in the production of drugs, fragrances, polymeric materials, synthetic detergents, plasticizers, dyes, papers, pesticides, etc. [1].

Due to their toxicity and carcinogenic activity they have significant detrimental influence on water quality or animals as well as on some plants, even at very low levels. Phenolic compounds are registered as pollutants in the US Environmental Protection Agency (EPA) and in directive 76/464/EEC of the European Union, related to dangerous substances discharged into aquatic environments. According to directive 76/464/EEC concentrations of phenolic compounds in surface water for drinking purposes should not be more than 1–10 mg L⁻¹. Current standard methods for phenolic compounds analysis in soil are based on Soxhlet extraction, i.e., time consuming and solvent-based method. Efficient extraction and recovery of phenols from solid samples remains a challenge. Several methods have been proposed such as microwave assisted extraction (MAE), accelerated solvent extraction (ASE), sonication with organic solvents, supercritical fluid extraction (SFE) and purge and trap (P&T) [2].