

## A FAST AND NEW METHOD TO QUANTIFY PAHS IN CONTAMINATED SOILS BASED ON FLASH-PYROLYSIS COUPLED WITH MOLECULAR ANALYSIS

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The diagnosis of soil contamination requires the screening of the soil for regulatory substances. Among them, PAHs represent the most encountered family of organic contaminant, impacting 200 000 sites in Europe [1]. The screening and quantification of PAHs in soils is usually done using chromatography technics (GC, LC) in combination with various detections (MS, FID, FLD...). These methods require sample preparation involving solvent extraction [2] (Soxhlet, sonication, pressurized liquid extraction: PLE) and often purification steps in order to get satisfactory analysis quality. These steps are rather time-consuming and not environment-friendly, even though several extractions methods based on supercritical CO<sub>2</sub> [3] or pressurized hot water [4] extractions, reducing the use of organic solvent, have been developed in the past decades. Moreover, the sample amounts usually required using these extraction methods are on the order of the gram to several hundred grams which can be problematic when working with limited amount of samples.

The objective of this study was to propose a new method for PAH quantification in contaminated soils that does not require extraction and purification steps, which consequently reduces the preparation time, and allowing to work on low sample amounts. This method consists in flash-pyrolysis (Py) coupled with GC-MS/FID. The pyrolyzer was equipped with a cryogenic trap allowing the concentration of the released compounds at the column head prior the GC analysis. The GC was equipped with a fast-GC column which reduced substantially the analysis time. The GC flow was split with an electronic pressure controller between the MS which allowed compound identification and the FID which was calibrated in order to quantify the PAHs.

This method was tested on five PAH contaminated soils, including one certified reference material (CRM) BCR-524. The amount of samples necessary for the analyses varied between 0.5 and 2 mg. The quantification results were compared to those obtained by the “classical” quantification method used in the lab (PLE followed by GC-MS analysis).

The first results showed satisfactory similarities between the two quantification methods. The best results were obtained for the CRM sample whereas the variability was higher for the other samples. These differences can be explained by different heterogeneity level of the samples. The concentrations of low molecular weight compounds (especially naphthalene and acenaphthylene) were always higher when obtained with the Py method. These higher concentrations can either be explained by a slight cracking phenomenon occurring during the pyrolysis or by a loss by evaporation of these volatile compounds during the concentration step of the “classical” quantification method.

These different hypotheses are currently under investigation to explain the slight differences observed between the quantification methods. In addition, supplementary samples are analyzed in order to fully validate the method but the first results are encouraging and underline the great potential of such technique for a fast and clean diagnosis of PAH soil contamination.

[1] European Environmental Agency (EEA), 2012, <http://www.eea.europa.eu/data-and-maps/figures/overview-of-contaminants-affecting-soil-and-groundwater-in-europe>. Accessed December 2013

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