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ABSTRACT BOOK

Responsible and Innovative Research for Environmental Quality
This study is based on the analysis of water concentrations and internal accumulation of bile metabolites of polycyclic aromatic hydrocarbons (PAHs) by fixed fluorescence (FF), as well as bioaccumulation response related to the biotransformation of contaminants. Benzene, toluene, ethylbenzene and xylene, commonly referred as BTEX, are constituents of fossil fuels that cause serious negative impacts on the environment and human health. At fuel stations whose storage tanks are leaking, these substances may in contact with the soil and even reach the groundwater. In order to detect the concentration of these compounds in contaminated soils, gas chromatography (GC) is the most commonly used technique. In the present work it is proposed the use of high performance liquid chromatography coupled to diode array detection (HPLC-DAD) for the determination of BTEX in soil samples. A methodology was developed using as mobile phase methanol and H₂O acidified with 250µL of H₂PO₄ (70:30, v/v), Eclipse XDB C18 column (5µm x 4.6 x 250mm), flow of 1.5 mL min⁻¹, i = 205nm and T = 50 °C. The analysis was carried out using the Agilent 1220 HPLC system equipped with an automatic injector, a column oven, and a diode array detector. Data were acquired using the OpenLAB CE system. A calibration curve for BTEX standards was constructed in 7 concentration levels: 1 to 68 ppm for benzene, 1 to 80 ppm for toluene, 1 to 80 ppm for ethylbenzene and 1 to 85 ppm for xylene. The curves were submitted to inter- and intra-assay repeatability analyses. Standard curves with adjustments above 0.991 relative standard deviations (% RSD) of less than 1.9% were obtained.

Reproducibility tests were performed with two solutions obtained from the standard solution. In the samples containing analytes from the soil contaminated with gasoline, % RSD was obtained below 6.5% and recovery rate was 68% for benzene and 75% for toluene, 78% for ethylbenzene and 78% for xylene. The method of soil analysis via HPLC is therefore efficient and as an alternative to be highlighted for analysis of high soil gas concentration is intended to validate the methodology using appropriate protocols and apply it in contaminated areas for the verification of BTEX levels in a next step.

MO20 Petroleum pollution of alluvial sediments near Sava river, Serbia

M. Ilic, IChTM / Department of Chemistry; S. Bulatovic, Faculty of Chemistry, University of Belgrade; T. Sotovic Knudsen, IChTM / Department for Chemistry; J. Milić, Institute of Chemistry, Technology & Metallurgy / Department of Chemistry; S. Milice, J. Avgdovic, Institute of Chemistry, Technology & Metallurgy, University of Belgrade / Department of Chemistry; G. Devic, Institute of Chemistry, Technology and Metallurgy, University of Belgrade Heating plant "New Belgrade" is located on the left coast of the Sava River, about 1km from its estuary in the Danube, and represents a potential source of petroleum pollutants for the alluvial area of the river, ground water as well as Sava river. The array of petroleum pollutants and their vertical migration in the alluvial area of Sava river. The installation was started in the summer of 2015. The soil was sampled in three different microlocations (Z1, Z2 and Z7) up to depth of 15m. The sampled material was organized in the layers, and for all microlocations was made a lithological profile. Most of the samples have had a sandy composition with low content of organic matter. Extraction of petroleum pollutants from soil samples were done using the Soxhlet apparatus with dichloromethane. After extraction, the dichloromethane extracts were then fractioned by column chromatography into fractions of: saturated hydrocarbons (Fraction I), aromatic hydrocarbons (Fraction II), and polar compounds (alcohols and keto compounds (Fraction III)). For monitoring changes in the vertical migration of petroleum pollutants, and their impact on soil characteristics, the group composition was determined for each borehole of all microlocations, taking into account their lithological profiles. Results of our research showed that in all samples the most represented were polar compounds (Fraction III), while the saturated hydrocarbons were least represented (Fraction I). This trend is almost unchanged in samples from different microlocation at different depths. It can be concluded that composition of petroleum pollutants can be changed throughout the alluvial sediments up to 15m depth and they can reach the underground waters, Sava river and consequently disturb the quality of the environment.

Risk-Based Approach: Assessment of Offshore Discharge Waters

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In 2012, OSPAR (Oslo and Paris Conventions) adopted the recommendation 2012.5 for a Risk-Based Approach (RBA) to the management of Produced Water (PW) discharges from offshore installations. The implementation of the RBA recommendations (2012.5) is implemented by the UK’s regulator, the Department for Business, Energy and Industrial Strategy (BEIS). The objective of the RBA is to assess the environmental risk of a PW discharge in the OSPAR maritime area. This is achieved by analysing the effluent and added substances to obtain a measure of the risk of the discharge. If the result is out-with the recommended criteria, a Produced Water Management Plan (PWMP) must be adopted to comply with the RBA regulatory requirements. Processing the information generated by the RBA, each PWMP would be specific to the discharged effluent, platform and area, aiming to minimise environmental risk of each PW discharge. The RBA method is compiled of a six-step process. The steps are based on a standard method where a Predicted Environmental Concentration (PEC) and a Predicted No Effect Concentration (PNEC) of the PW or individual products are determined, and a PEC/PNEC ratio is calculated. The PEC/PNEC ratio and Environmental Impact Factors (EIF), which describe a particular product’s potential environmental impact, determine the environmental risk. The PW is characterised at a substance level, highlighting the components which contribute to the overall environmental risk, and will fed directly into the PWMP. Notably in the UK RBA methodology is the absence of PW WEA concerning sensitivity to fish, and we therefore studied the comparative inference of use of different trophic level species, including fish (Cyprinodon variegatus). This study provided unique and important empirical data and information to evaluate significant considerations for implementation of regulatory PW management methodology. In addition to the potential environmental impact and comparative contribution from production chemicals & naturally occurring substances, and validity of the step-wise tiered screening approach, the investigations provided valuable assessment into adequacy and sensitivity of ecologically relevant species and the implications for regulatory monitoring regime.
Introduction

Heating plant "New Belgrade" is located on the left coast of the Sava River, about 1km from its estuary in the Danube, and represents a potential source of petroleum pollutants for the alluvial area of the river, ground water as well as Sava river (Fig.1.).

Presence of different oil pollutants in the soils and sediments in this area has already been confirmed (Miletic et al., 2015). The aim of our research was to determine the presence of petroleum pollutants and their vertical migration in the alluvial area of Sava river.

The investigation was started in the summer of 2015. The soil was sampled in three different microlocations (Z1, Z3 and Z7) up to depth of 15m. The sampled material was organized in the layers, and for all microlocations was made a lithological profile. The samples have had a clayey-sand structure with low content of organic matter.

Materials & methods

Extraction of petroleum pollutants from soil samples were done using the Soxhlet apparatus with dichloromethane. After extraction, the dichloromethane extracts were then fractioned by column chromatography into fractions: saturated hydrocarbons (Fraction I), aromatic hydrocarbons (Fraction II), and polar compounds (alcohols and keto compounds (Fraction III) [1].

For monitoring changes in the vertical migration of petroleum pollutants, and the relationship of this migration with the soil characteristics, the group composition was determined for each borehole of all microlocations, taking into account their lithological profiles (Jovanović et al., 2005).

Results & discussions

Results of our research showed that in all samples the most represented were polar compounds (Fraction III), while the saturated hydrocarbon were least represented (Fraction I). This trend is almost unchanged in samples from different microlocation at different depths. (Fig.2.).

Conclusions

It can be concluded that composition of petroleum pollutants can be unchanged through the alluvial sediments up to 15m depth and they can reach the underground waters, Sava river and consequently disturb the quality of the environment.

References


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We certify that

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