EMEC21

21st European Meeting on Environmental Chemistry
November 30 – December 3, 2021, Novi Sad, Serbia

Association of Chemistry and the Environment

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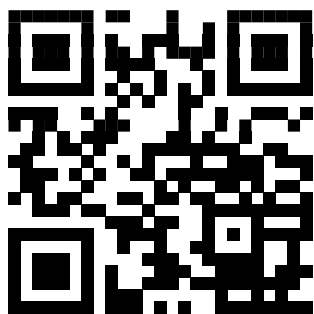
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BOOK OF ABSTRACTS

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Soil Contamination by Petroleum Products in the Urban Environments: Belgrade, Serbia

G. Devic[1], M. Ilic[1], S. Bulatovic[2], S. Miletic[1], M. M. Vrvic[2]. (1) University of Belgrade, Institute of Chemistry, Technology and Metallurgy, Njegoševa 12, 11000 Belgrade, Serbia, (2) Faculty of Chemistry, University of Belgrade, Studentski trg 12-16, 11000 Belgrade, Serbia; gordana.devic@ihtm.bg.ac.rs and gdevic@chem.bg.ac.rs.

Environmental pollution with petroleum and petrochemical products has attracted much attention in recent years. The present study is focused on the investigation of urban soil pollution in the area of thermal plant New Belgrade with more than 200000 residents. Thermal Power Plant New Belgrade is located on the left bank of the Sava, about 1 km from the Sava's confluence with the Danube. The Thermal Power Plant complex consists of storage tanks for crude oil and oil products and it was contaminated due to break-down of the mazut reservoirs (2009, during a gas crisis) and NATO bombing of the reservoirs (1999).

A total of 45 soil samples were collected in May, 2015, and in total 8 geochemical parameters were determined by using official or recommended methods [1].

Statistical data processing includes application of multivariate statistical methods to previously systematized data on geochemical parameters in soil samples from Belgrade city. Two multivariate statistical methods have been applied – hierarchical cluster analysis (HCA) and factor analysis – analysis of the main components (PCA).

From the output of the hierarchical cluster analysis, a total of three clusters of the soil samples were recognized according to the level of clustering. Cluster A and B are linked at a shorter distance and are together linked to Cluster C at a longer distance. Component 1 of the PCA dominated in group A. Samples of group A contained the maximum amounts of total aliphatic hydrocarbon (TPH) (71.85±17.9), and Unresolved/Resolved complex mixture (U/R) (3.02±1.8) higher than the other groups. The results of the soil analyses indicated that most samples classified as C1 may reflect anthropogenic contamination of the urban environment. The results showed that the top soil contained high concentration of TPH (90.65 mg kg^{-1}). This may be a result was caused by crude oil spills and leaks which continuously occured for long periods of time. According to the "Regulation on the program of systematic monitoring of land quality, indicators for According to the "Regulation on the program of systematic monitoring of land quality, indicators for assessment of the risk of land degradation and the methodology for making remediation programs "(Official Gazette of RS, No. 88/2010-Annex 13) are not higher than" values that may indicate significant contamination "-remediation values, but are higher than "limit values", which means that this area must be programs "(Official Gazette of RS, No. 88/2010-Annex 13)) are not higher than" values that may indicate significant contamination "-remediation values, but are higher than" limit values ", which means that this area must be under permanently monitoring.

Group B is represented by a principal component 2 related to the highest CPI (3.48±1.32), Low/High alkanes (0.299±0.45), and ACL (the average number of carbon atoms per molecule based on the abundance of odd-carbon-numbered higher plant n-alkanes) (29.67±0.40). The analyzed samples have similar ACL contents in all groups. Distribution of these parameters suggesting predominant biogenic sources rather than petroleum related input.

The component 3 of the PCA2, loaded by n-C17/ Pr, and n-C18/Phy, also constituted a strong cluster C, n-C17 and n-C18 are more abundant than the isoprenoids pristane and phytane. Comparatively, isoprenoid hydrocarbons are more resistant to biodegradation than n-alkanes [2], leading to the increase of Pr/ n-C17 and Ph/n-C18 ratios to a value of much higher than 1 when they have been deeply degraded [3]. The distribution of Pr/n-C17, and Ph/n-C18 ratios for almost all samples are small than 1, indicate biogenic contribution, except of some samples are around 1, points to petroleum contamination source in urban area of Belgrade city.

Acknowledgements

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