BOOK OF ABSTRACTS

TRAINING COURSE ON CHEMICAL CONTAMINANTS IN THE ENVIRONMENT

University of Novi Sad, Faculty of Technology Novi Sad,

Novi Sad, Serbia

21-23 July 2014

TRAINING COURSE ON CHEMICAL CONTAMINANTS IN THE ENVIRONMENT
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The Training Course is organized by the Centre of Excellence in Food Safety and Emerging Risks (CEFSER) of the Faculty of Technology, University of Novi Sad, jointly with the colleagues from China who are collaborators within the bilateral project "Human exposure assessment to heavy elements, phthalic acid esters and persistent organic pollutants through air, water, dust and food" funded within the SERBIAN - CHINESE SCIENCE & TECHNOLOGY COOPERATION PROGRAM FOR YEARS 2013-2015. It is planned as one of the project activities aiming to bring closer the research efforts in two distant and quite different countries, Serbia and China, and to get to know each other exploring the complementarities and possibilities for further joint reseach and projects.

PROGRAM

TRAINING COURSE ON CHEMICAL CONTAMINANTS IN THE ENVIRONMENT
University of Novi Sad, Faculty of Technology Novi Sad
21-23 July 2014

21 July 2014

10.30-11.00	Registration
11.00-11.05	**Welcome speech,** Prof. Dr. Biljana Škrbić, Head of the Center of Excellence in Food Safety and Emerging Risks (CEFSER), *Faculty of Technology Novi Sad*
11.05-11.35	**Introduction to the CEFSER capacities and activities,** Biljana Škrbić
11.35-11.50	**Presentation of the Serbian-Chinese project "Human exposure assessment to heavy elements, phthalic acid esters and persistent organic pollutants through air, water, dust and food" under the SERBIAN - CHINESE SCIENCE & TECHNOLOGY COOPERATION PROGRAM FOR YEARS 2013-2015**, Biljana Škrbić
11.50-12.10	Coffee break
12.10-12.30	**Research activities and achievements of the College of Environmental Science and Engineering, Nankai University,** Dr. Ji Yaqin, *Nankai University*
12.30-13.00	**Occurence of phthalic acid esters in the environment,** Shaofei Kong, Yaqin Ji, Lingling Liu, Li Chen, Xueyan Zhao, Jiajun Wang, Zhipeng Bai, Zengrong Sun
13.00-14.30	Lunch break
14.30-15.15	**Sampling methods for the phthalic acid esters determination**, Fumei Wang, Yaqin Ji
15.15-15.45	**Polycyclic aromatic hydrocarbons (PAHs) distribution in China: from sources to environment,** Shaofei Kong, Yaqin Ji, Zhipeng Bai, Yan Yin
15.45-16.45	**Preparation of samples and analytical methods for the phthalic acid esters determination**, Dekun Zou, Yaqin Ji

TRAINING COURSE ON CHEMICAL CONTAMINANTS IN THE ENVIRONMENT
University of Novi Sad, Faculty of Technology Novi Sad
21-23 July 2014

22 July 2014

10.30-11.00	**Trends in the chemical contaminants analysis in the environmental and food matrices,** Biljana Škrbić, Nataša Đurišić-Mladenović
11.00-11.30	**Analysis of mycotoxins by UHPLC-HESI-MS/MS,** Biljana Škrbić, Jelena Živančev
12.00-12.30	**Analysis of PCBs, OCPs and pyrethroids by GC/μECD and GC/MS**, Biljana Škrbić, Igor Antić, Nataša Đurišić-Mladenović
12.30-13.00	**Analysis of PAHs by UHPLC-MS,** Biljana Škrbić, Nataša Đurišić-Mladenović, Igor Antić
13.00-14.30	Lunch break
14.30-15.00	**Analysis of heavy elements,** Biljana Škrbić, Jelena Živančev
15.00-15.30	**Pharmaceuticals in the environment,** Mira Petrović, Biljana Škrbić
15.30 -16.00	**Perfluorinated compounds in the food,** Marinella Farré, Biljana Škrbić,
16.00-16.30	**Distribution of particulate matter in the urban atmosphere,** Vesna Marinković, Anita Petrović Gegić, Branko Savić, Biljana Škrbić

23 July 2014

10.00-10.45	Practical session I: **Illustrative (video) presentation of the sampling and preparatory methods for the phthalic acid esters determination**
10.45-13.00	Practical session II: **GC/MS analysis of the phthalic acid esters**
13.00-14.00	Lunch break
14.00-16.00	Practical session III: **- analysis of the mycotoxins by UHPLC-HESI-MS/MS** **- analysis of heavy elements by GFAAS**
16.00-18.00	Practical session IV: **-analysis of PCBs, OCPs and pyrethroids by GC/μECD and GC/MS** **-analysis of PAHs by UHPLC-MS**

ABSTRACTS

TRAINING COURSE ON CHEMICAL CONTAMINANTS IN THE ENVIRONMENT
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Introduction to the capacities and research activities of the Laboratory for Chemical Contaminants at the Faculty of Technology

Biljana Škrbić

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Laboratory for Chemical Contaminants in Food and the Environment at the Faculty of Technology is a unique Western Balkan laboratory for analysis of chemical contaminants in various matrices that has been recently established as the Center of Excellence in Food Safety and Emerging Risks (CEFSER) through the FP7 project CEFSER. It is equipped with highly sophisticated analytical instruments like ultra high performance liquid chromatographs with triple quadrupole and high resolution mass spectrometers, gas chromatographs with mass spectrometer, micro-electron capture detector and flame ionization detector, atomic absorption spectrometer with graphite furnace, accompanied with various sample prep equipment (accelerated solvent extractor, microwave digestion unit, ultra pure water system, rotary evaporator, sample evaporator with heating block, etc.). The main CEFSER research interests are: environmental pollution and protection, conventional and alternative gaseous fuels, food chemical safety, application of chemometrics, waste valorization, etc. The CEFSER team has the highest publication record with more than 500 papers/presentations of which 89 articles are published in leading international journals with impact factors. Strong collaboration links with advanced international institutions like University of Szeged, Hungary, Department of Environmental Chemistry, Barcelona, Spain, Catalan Institute for Water Research, Girona, Spain, CHIRON AS, Trondheim, Norway, and Thermo Fisher Scientific, Prague, Czech Republic, have been established and verified through joint projects (e.g. FP7, IPA HU-SRB, COST) and publications.

The presentation overviews the research capacities, activities and achievements of the CEFSER team, promoting it as the modern center open for international collaboration.

Acknowledgment: The presentation is supported by Secretariat for Science and Technological Development of the Province of Vojvodina, contract no. 114-451-3733/2011-01.

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University of Novi Sad, Faculty of Technology Novi Sad
21-23 July 2014

Presentation of the Serbian-Chinese project "Human exposure assessment to heavy elements, phthalic acid esters and persistent organic pollutants through air, water, dust and food" under the SERBIAN - CHINESE SCIENCE & TECHNOLOGY COOPERATION PROGRAM FOR YEARS 2013-2015

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Project "Human exposure assessment to heavy elements, phthalic acid esters and persistent organic pollutants through air, water, dust and food" was contracted in June 2013 under the SERBIAN - CHINESE SCIENCE & TECHNOLOGY COOPERATION PROGRAM FOR YEARS 2013-2015

This project has been design in a way to explore the complementarities of the partners College of Environmental Science and Engineering, Nankai University and Faculty of Technology University of Novi Sad with a final aim of creating the long-lasting synergetic cooperation of two institutions as a solid ground for future joint research. The project enables knowledge exchange and transfer between Chinese and Serbian teams that have been both well known for the expertise in various aspects of the environmental chemical contaminants.

The main scientific objective addressed in the project is an assessment of human exposure to different pollutants, including both inorganic (heavy elements) and organic pollutants (e.g. persistent organic pollutants and phthalic acid esters). The collaboration of Chinese and Serbian researchers within the framework of this project is going to enable first comparative results of the air and food pollution regarding the selected organic and inorganic pollutants, in two countries with quite different developing stages, making a basis for estimation of the effects that industrialization and urbanization have on the environmental and food safety. Moreover, the presence of phthalic acid esters in foodstuffs will be considered for the first time in Serbia, leading to the preliminary results on occurrence of these pollutants in samples from Serbia as well as on the Serbian population exposure to these pollutants.

Partnership within this bilateral collaboration is based on complementary knowledge of Chinese and Serbian researchers. Expected project results are: open-access gatherings for the presentation of the visiting researchers at the institutions, joint research activities, joint articles and presentations, training course at the Faculty of

Technology Novi Sad, workshop at College of Environmental Science and Engineering, Nankai University.

Acknowledgement: The presentation is supported by Secretariat for Science and Technological Development of the Province of Vojvodina, contract no. 114-451-4568/2013-01.

TRAINING COURSE ON CHEMICAL CONTAMINANTS IN THE ENVIRONMENT
University of Novi Sad, Faculty of Technology Novi Sad
21-23 July 2014

Occurence of phthalic acid esters in the environment

Shaofei Kong [1,2,3], Yaqin Ji [1,2*], Lingling Liu [1,2], Li Chen [1,2], Xueyan Zhao [1,2], Jiajun Wang [1,2], Zhipeng Bai [1,2], Zengrong Sun [4]

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Phthalic acid esters (PAEs) are produced in large amounts throughout the world and are excessively used in various industries, which have posed a serious threat to human health and the environment. Tianjin city suffers from severe environmental pollution because of dense agricultural production, commercial administration and harbor transportation activities and rapidly developing industries including machinery, electronics, petroleum and chemicals, construction, metallurgy, textiles and vehicles. This report focuses PAEs in the two environmental matrices-air and soil and includes two fractions which are detailed discussed below respectively.

Firstly, an investigation of six major PAEs congeners in atmospheric PM_{10} and $PM_{2.5}$ was synchronously conducted at seven sites of different functional zones in spring, summer and winter in Tianjin, China in 2010. Results showed that the average concentrations of DMP, DEP, DBP, BBP, DEHP and DOP in PM_{10} were 0.88, 0.73, 12.90, 0.15, 98.29 and 0.83 ng m^{-3}, respectively, and in $PM_{2.5}$, they were 0.54, 0.30, 8.72, 0.08, 75.68 and 0.33 ng m^{-3}, respectively. DEHP and DBP were the predominant species. The industrial site exhibited highest PAEs values as 135.9±202.8 ng m^{-3}. In winter, the six PAEs concentrations were higher than that in spring and summer, which may be related to the influence of emission sources, meteorological parameters and the chemical and physical characteristic of themselves. Except for DOP, other PAEs were negatively correlated with ambient temperature and the relationships were best fitted as exponential forms. Significant positive correlations were found for PAEs in $PM_{2.5}$ and PM_{10}, indicating common sources. The $PM_{2.5}/PM_{10}$ ratios (0.53-0.70) for the six PAEs concentrations suggested that they were preferentially concentrated in finer particles. Principal component analysis indicated the emission from cosmetics and personal care products, plasticizers and sewage and industrial wastewater were important sources for PAEs in atmospheric particulate matter in Tianjin.

Secondly, eighty-five soil samples including farmland soil, vegetable soil, orchard soil and wasteland soil were collected from the suburban area of Tianjin in Nov. 25-Nov. 30 of 2009 to study the distribution of six priority PAEs. Total PAEs varied from 0.05 to 10.4 μg g^{-1}, with a median value of 0.32 μg g^{-1}. Di-(2-ethylhexyl) phthalate and di-n-butyl phthalate are most abundant. PAEs concentrations for the four types of soils exhibited decreasing order as vegetable soil (1.58±2.94 μg g^{-1})>wasteland soil (0.58±0.46 μg g^{-1})>farmland soil (0.52±0.57 μg g^{-1})>orchard soil (0.33±0.26 μg g^{-1}). PAEs exhibited elevated levels in more developed regions when compared with other studies. Principal component analysis indicated the emission from cosmetics and personal care products and plasticizers were important sources for PAEs in suburban soils in Tianjin. Different types of soils have different predictive PAEs. The contents of PAEs in wasteland soil should raise much attention.

TRAINING COURSE ON CHEMICAL CONTAMINANTS IN THE ENVIRONMENT
University of Novi Sad, Faculty of Technology Novi Sad
21-23 July 2014

Sampling methods for the phthalic acid esters determination

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A total of 448 samples including foodstuffs, drinking water, soil, ambient PM_{10} and indoor PM_{10} and indoor dust samples from Tianjin were obtained to determine the six priority phthalates (PAEs). Daily foods consumed by Tianjin residents were randomly purchased from grocery stores or supermarkets. The food samples included meat, poultry, fish, vegetable, fruit, milk (pure and yogurt milk), and two staple food samples. 92 tap water samples were collected from residents' houses located in six districts in Tianjin city in the dry season (in June) and wet season (in July) using 1-L solvent-cleaned brown glass bottles. 84 soil samples were obtained in suburban farmland, vegetable, orchard and wasteland soils of Tianjin. Soil samples were collected at the center of each site, away from plant roots and recently fertilized area using a pre-cleaned stainless steel scoop into pre-cleaned aluminum foil envelopes. Each sample consisted of five sub-samples collected from the surrounding of each site. Ambient PM_{10} were continuously collected at seven sampling sites which are located in different functional areas: including an industrial area, residential area, commercial area, traffic area and educational area. Samples were collected onto quartz filters (Ø=90 mm) by using medium-volume samplers. The samplers were operated at a flow rate of 100 L/min with a 10-μm cut-point. The flow rate of each sampler was equipped with a mass-flow controller and calibrated automatically with bubble flow meters. 82 indoor PM_{10} and indoor dust were all collected from 13 individual homes in four urban residential areas of Tianjin city. The indoor air samplings were performed for four consecutive days. A typical air sample consisted of approx. 5.76 m^3 of air sampled at a linear velocity of 4 L/min for 24 h. The indoor dust samples were obtained by sweeping the floors (living room and bedroom) with a paper dust bag and screened through mesh size of 60.

TRAINING COURSE ON CHEMICAL CONTAMINANTS IN THE ENVIRONMENT
University of Novi Sad, Faculty of Technology Novi Sad
21-23 July 2014

Polycyclic aromatic hydrocarbons (PAHs) distribution in China: from sources to environment

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Polycyclic aromatic hydrocarbons (PAHs) emitted from natural and anthropogenic sources including fossil fuels combustion, vehicle exhaust, open-fire straw burning, cigarette smoking, wood combustion, industrial production including waste incineration, metal production, coke production, iron production, airplane production, etc., are a class of organic compounds that consist of two or more fused aromatic rings with some of them being carcinogenic and mutagenic. They are generated by incomplete combustion and pyrolysis or pyro-synthesis of fossil fuels and other organic matters, which represent a risk to both environment and health. China is suffering from serious air pollution especially for particulate matter. This study focuses on the PAHs emission sources and PAHs distributions at some typical cities of China.

Firstly, the levels and profile characteristic for 18 kinds of PAHs in $PM_{2.5}$ and PM_{10} from stack gases for six types of stationary sources (thermal-power stations, power plants, industrial boilers, sinter, coke oven and cement plant), three types of vehicles (gasline, diesel and natural gas), four types of domestic fuel burning (raw coal, honey coal, straw and wood) and three types of dust (road, soil and re-suspended dusts) are investigated. For combustion sources, different self-designed dilution sampling systems are adopted. For dust, a self-designed resuspension chamber is adopted. PAHs are analyzed by GC-MS. Results showed that the mass concentrations of PAHs, the contents of abundant PAHs, ring distribution, toxicity, markers, specific PAHs ratios, etc in PM_{10} and $PM_{2.5}$ were different for various sources and the two size of particles. Secondly, the PAHs in atmospheric particulate matter (PM) in several heavy polluted regions (five cities in a trandional heavy-industrial base of China, five sites in a developing heavy-industrial city, an industrial site at Nanjing) and a background mountainous site (Mt. Huangshan) are studied by our group. The mass concentrations, size distribution, spatial and temporal variation, sources and health risks of PAHs in PM are obtained and identified in these sites.

Detailed information will be shown in the report. The data in this study will be useful for updating the PAHs profiles, emission inventories and conducting source apportionment studies.

TRAINING COURSE ON CHEMICAL CONTAMINANTS IN THE ENVIRONMENT
University of Novi Sad, Faculty of Technology Novi Sad
21-23 July 2014

Preparation of samples and analytical methods for the phthalic acid esters determination

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Samples Extraction

Soil and Indoor Dust: Taking 5 g soil (Indoor Dust) into a clean centrifuge tube; 10 milliliters of dichloromethane was added, and they were extracted with an ultrasonic extractor for 15 minutes. Filtered with filter paper. The upper extracts were filtered into a 25-milliliter clean centrifuge tube. The extracts were then extracted for a second time with another 10 milliliters of dichloromethane.

All extracts were transferred into concentration tubes after the volume was reduced to approximately 5 milliliters by purified nitrogen; they were then concentrated to below 2 milliliters by purified nitrogen. After the internal standard solution was added, the volume was adjusted to 2 milliliters with dichloromethane. They were finally transferred into auto-injection vials and stored in a refrigerator at -4˚C.

Atmospheric PM_{10} and $PM_{2.5}$: Samples were collected onto quartz filters with medium-volume samplers used. Blank samples were collected simultaneously. The filters were cut into pieces into a clean centrifuge tube (with glass stoppers); The following detailed extraction methods could be found in our previous study as soil.

Drinking water (Tap water): A solid-phase extraction (SPE) method was optimized. Methanol (5 mL) and ultra-pure water were used to activate and elute the cartridge. All the adjusted aqueous samples (250 mL) were passed through the cartridges with the auto-samplers at the flow rate of 4 mL•min^{-1}.

Afterwards the cartridge was dried with the vacuum pump. Elution solvent (10 mL) was added to the cartridge to elute the target compounds with 10-milliliter centrifuge tubes below to collect the elution. The following detailed extraction methods could be found in our previous study as soil.

Foodstuffs: Taking 3 g samples into a 10 mL centrifuge tube; 6 milliliters of n-hexane was added, and they were extracted with an ultrasonic cell disrupter for 18 minutes. Centrifuge 5 min in a centrifuge with a 4000 r/min speed.The following detailed extraction methods could be found in our previous study as drinking water.

Analytical procedures

Gas chromatography is the most widely used analytical technique for the determination of phthalates. Our analysis of PAEs was performed with an Agilent system consisting of a 6890N gas chromatograph and an Agilent 5975Bmass spectrometry in the selective ion-monitoring (SIM) mode.

TRAINING COURSE ON CHEMICAL CONTAMINANTS IN THE ENVIRONMENT
University of Novi Sad, Faculty of Technology Novi Sad
21-23 July 2014

Trends in the chemical contaminants analysis in the environmental and food matrices

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The presence and the prevalence of diverse, potentially harmful, contaminants in our food and environment have been the objective of many studies and will continue to be so in future, since associating chemical contaminants with effects has always been a key element in the fields of environmental and food research. Most known chemical contaminants are small organic molecules; they are typically present in the samples at low concentrations (parts per trillion to parts per million); thus, their analyses in complex food and environmental matrices are often quite challenging. The basic analytical approach involves an extraction using a suitable solvent, cleanup to remove interfering matrix components, a chromatographic separation and a selective detection. However, cleanup procedures are often oriented towards separation of one class of chemical compounds of interest that have similar physical-chemical properties; discarding the remaining extract lead to loose of data on the other contaminants potentially coexisting in the sample.

Thus, one of the great challenges currently in domain of the environmental and food safety is to assess the risks associated with mixtures of contaminants, so one of the major trends of analytical chemistry is to develop fast, efficient procedures for the trace analysis of different classes of organic compounds in one analytical run. The implementation of mass spectrometry (MS) as a detection technique has truly revolutionized the analysis of chemical contaminants in foods and has allowed target and non-target multicompound analysis in extracts obtained by employment of simple and time-effective preparation methods. This presentation gives the overview of the most recent trends in sample preparation and analytical methods for determination of chemical contaminants in various matrices, primarily the procedures based on MS developed in the CEFSER labs at the Faculty of Technology Novi Sad.

Acknowledgement: The work is supported by the project “Occurence of emerging pollutants in the environment and foodstuffs from the Serbian market” coordinated by Prof. Dr. B. Škrbić and funded by the Secretariat for Science and Technological Development of the Province of Vojvodina.

TRAINING COURSE ON CHEMICAL CONTAMINANTS IN THE ENVIRONMENT
University of Novi Sad, Faculty of Technology Novi Sad
21-23 July 2014

Analysis of mycotoxins by UHPLC-HESI-MS/MS

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Mycotoxins are toxic metabolites produced by fungal species that commonly contaminate staple foods and feeds. Naturally occurring mycotoxins are of public concern due to their association with a wide range of adverse health effects. Most mycotoxins are chemically stable; they survive storage and processing, and could even remain in cooked food. Thus, to protect consumers from exposure to mycotoxins, many countries, including European Union, have adopted food regulations to limit exposure to mycotoxins. The most well-known mycotoxins are aflatoxins (AFs), ochratoxin A and some *Fusarium* toxins (deoxynivalenol (DON), zearalenone (ZON), fumonisins (FBs)) and they are usually present in low concentrations in complex matrices, making the analysis challenging. In recent years there is a growing tendency to develop rapid LC-mass spectrometry (MS) methods with minimum sample treatments for multiclass mycotoxin analysis. Approaches commonly employ solid–liquid extraction (SLE), solid phase extraction (SPE), and/or liquid–liquid extraction (LLE) with the subsequent direct injection to LC-MS instrumentation and/or immunoaffinity-column (IAC) clean-up.

The aim of this presentation is to give an overview on the analytical procedures developed for the mycotoxins determination in the different matrices and the first results of the toxin cooccurence in the food samples collected marketed in Serbia.

Acknowledgement: The work is a part of the project no. 172050 coordinated by Prof. Dr. Biljana Škrbić and funded by the Ministry of Education, Science and Technological Development of the Republic of Serbia.

TRAINING COURSE ON CHEMICAL CONTAMINANTS IN THE ENVIRONMENT
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Analysis of PCBs, OCPs and pyrethroids by GC/μECD and GC/MS

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Organochlorine compounds, like polychlorinated byphenils, organochlorinated pesticides (OCPs) and pyrethroids are synthetic compounds ubiquitously occurring in environmental samples, such as air, water, soil, and sediments, and also in food and biological tissues due to their low solubility in water and high persistence despite the banned or restricted usage primarily in industrialized countries. Even though these compounds belong to different chemical classes, development of the analytical method for their simultaneous determination in samples is in line with the latest trend of the multicompound procedures.

This work aims to present the properties of these three classes of organochlorine compounds and the latest information on their presence in various samples worldwide. Moreover, the fast and simple analytical procedure developed in the CEFSER Lab at the Faculty of Technology for quantitative determination of pyrethroids and screening of OCPs and PCBs in the milk samples is presented. This presentation gives the first preliminary results on the organochlorine compounds (including pyrethroids) in the milk samples marketed in Serbia.

Acknowledgement: The work is a part of the project "Estimation of chemical safety of market basket and population dietary exposure" coordinated by Prof. Dr. B. Škrbić and funded by the Secretariat for Science and Technological Development of the Province of Vojvodina.

TRAINING COURSE ON CHEMICAL CONTAMINANTS IN THE ENVIRONMENT
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21-23 July 2014

Analysis of PAHs by UHPLC-MS

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Polycyclic aromatic hydrocarbons (PAHs) are fused-ring aromatic compounds formed in incomplete combustion of organic material during a number of activities (automobile exhausts, domestic heating, biomass burning, industrial activities, oil spillage, etc.). PAHs are generally found throughout the environment and they can be also found in food matrices due to contamination by PAHs present in air, soil or water, by industrial food processing or home food preparation methods. They might be found always in the form of complex mixtures, never as individual compounds. This also means that humans are always exposed to complex mixtures of PAHs with different degrees of biological activity, implying the need for their constant monitoring. Analytical methods applied for the determination of PAHs are mostly based on gas (GC) or liquid chromatographic (HPLC) techniques and different sample preparation steps. This presentation overviews the traditional and more recent advanced methods for PAH analysis in different matrices, presenting also the results on analytical procedure development for determination of 22 PAHs by ultra high performance liquid chromatography coupled to high resolution mass spectrometer with atmospheric pressure photo ionisation (APPI) as a novel ionisation technique for liquid chromatography–mass spectrometry (LC–MS).

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TRAINING COURSE ON CHEMICAL CONTAMINANTS IN THE ENVIRONMENT
University of Novi Sad, Faculty of Technology Novi Sad
21-23 July 2014

Analysis of heavy elements

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The presence of heavy elements in food depends on several factors; they might come from: the soil, environment, genotype of the plant, fertilizers and/or metal-containing pesticides, introduced during the production process or by contamination from the metal processing equipment. Hence, the accumulation of heavy elements in the food has been of increasing concern due to food safety issues and potential health risk. Therefore, there is the need to investigate the possible risks for the population due to the chronic exposure to heavy metal contamination of different foodstuffs.

This presentation describes the optimization and validation of a quick and simple method for determination of the arsenic (As), cadmium (Cd) and lead (Pb) contents in samples of various foodstuff samples by atomic absorption spectrometer (AAS) with a graphite furnace (GF). The considered food items are collected in the domestic markets and they represented the most consumed foodstuffs according to the Serbian national market basket. The results on the occurrence of these three elements in selected foddstuffs served as a basis for health risk assessment through dietary exposure of the Serbian adult consumers.

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TRAINING COURSE ON CHEMICAL CONTAMINANTS IN THE ENVIRONMENT
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Pharmaceuticals in the water

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The presence of pharmaceutically active compounds as environmental micropollutants has become a new emerging problem, which has awakened great concern among scientists in the last few years. Pharmaceuticals are a large and diverse group of compounds designed to prevent, cure and treat disease and improve health. They have long been used in significant quantities throughout the world. After intake, these pharmaceutically active compounds undergo metabolic processes in organism. Significant fractions of the parent compound are excreted in unmetabolized form or as metabolites into raw sewage and wastewater treatment systems.

Although, pharmaceuticals are new contaminants, the information concerning their concentration and environmental fate has been reported in the last decade in a number of studies from developed countries; however, there is a need for comprehensive study of as wide as possible range of PhAC in waters from other regions as well. The aim of this presentation is to give an overview of the results on the pharmaceuticals levels in waters from Serbia and compared with the relevant data from the literature. The presented data were obtained as a part of the study on the simultaneous occurrence of pharmaceuticals in different types of water from the northern part of Serbia, performed jointly by CEFSER and Catalan Institute for Water Research.

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TRAINING COURSE ON CHEMICAL CONTAMINANTS IN THE ENVIRONMENT
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Perfluorinated compounds in the food

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The work presents the first data of the levels of 21 perfluoroalkyl substances (PFASs) in 36 food items from Serbia. The analysis was carried out by online sample preparation combined with liquid chromatography with triple quadrupole mass spectrometer using electrospray ionization in negative mode. The analytical parameters of the method fulfill the requirements specified in the European Commission Recommendation 2010/161/EU: recovery rates were in the range 70-120%; the method limits of detection and the method limits of quantification were in the range 5-650 pg/g and 17-2000 pg/g, respectively.

The concentrations of PFASs were in the range of the pg/g or pg/ml levels. The most frequently detected compounds were perfluorooctane sulfonic acid (PFOS), perfluorooctanoic acid (PFOA) and perfluorobutanoic acid (PFBA).

The results were compared with data on PFASs occurrence in food widely consumed in South America, Western Asia and Mediterranean countries. The differences were identified when the compounds profile and their relative abundances in the samples from different regions were compared. However, in absolute quantities of total PFASs no large differences were observed.

The results provided the first assessment of the daily intakes of PFASs through diet in accordance to the information given by the national market basket. It could be concluded that tolerable daily intakes was not exceeded by far.

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TRAINING COURSE ON CHEMICAL CONTAMINANTS IN THE ENVIRONMENT
University of Novi Sad, Faculty of Technology Novi Sad
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Distribution of particulate matter in the urban atmosphere

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The urban population is increasingly exposed to atmospheric particulate matter (PM), which encompasses both solid and liquid particles suspended in the air. They can be divided by size into three groups: coarse particulate matter smaller than 10 μm (PM_{10}), fine particulate matter smaller than 2.5 μm ($PM_{2.5}$) and ultra fine particulate matter smaller than 0.1 μm ($PM_{0.1}$). The main source of anthropogenic PM is the urban transportation vehicles. The health effects of particulate matter depend on their size. Short-term and long-term exposure to $PM_{2.5}$ are directly associated with various health effects, including respiratory and cardiovascular diseases.

The content of total suspended particles was measured in Novi Sad, in March 2014, on four sampling sites. The sampling sites (international bus station and three bus stops along the busiest boulevard) and times (afternoon rush) were chosen in order to measure the maximum exposure of the population. PM quantification in this study was performed by using a "Microdust pro" real time dust monitor, with a detection limit of 1 μg/m^3. Each measurement lasted for 30 minutes, with readouts obtained every minute. The highest 30-minute average dust concentration was measured at the international bus station (34 μg/m^3). This result is not surprising, given the fact that there is the highest frequency of traffic. On the other sampling sites, average dust concentration ranged from 1 to 6 μg/m^3. The obtained results are compared with the average values of PM concentration (1.9 μg/m^3), provided by the measurement station of the city's Health authority. The station is located on the same boulevard, 15 m from the traffic lanes.

The results of all measurements show concentrations significantly below the allowed average concentration (120 μg/m^3/day) according to the Regulation on the conditions and requirements for monitoring air quality (Official Gazette of RS 63/2013). These results suggest that the city of Novi Sad has a good ambient air.

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ABOUT THE CEFSER

CEFSER material resources

- ultra high performance liquid chromatography with triple quadrupole mass spectrometer (UHPLC-MS/MS), Accela-TSQ Vantage, Thermo Fisher Scientific

ultra high performance liquid chromatography with high resolution mass
- spectrometer with Orbitrap technology (UHPLC-MS), Accela, Exactive, Thermo Fisher Scientific

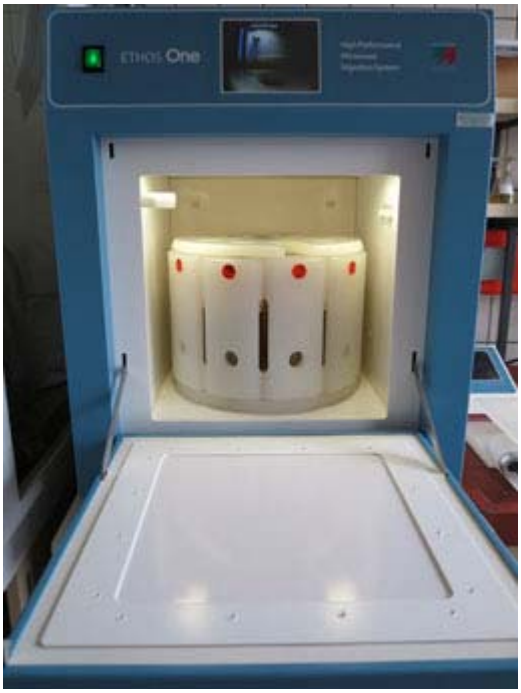
- gas chromatograph with mass spectrometry detector (GC/MS), Agilent 7890B/5977MSD

- gas chromatograph with flame-ionization detector (GC/FID), DANI GC1000

• gas chromatograph with micro electron capture detector (GC/ECD), Agilent 7890A

• atomic absorption spectrometer with a graphite tube (GTAAS), Varian AAS240/GTA120

• microwave digestion system, Ethos One, Milestone



• accelerated solvent extractor, Dionex ASE350, Thermo Scientific

• centrifuge, Thermo Scientific

• ultra pure water system, Millipore

• water deionization system

• sample concentrator with block heater

- rotary vacuum evaporator

Prof. Dr. Biljana Skrbic,
Founder and Head of the CEFSER

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