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日本環境化学会

第 22 回　環境化学討論会

講演要旨集

22nd Symposium on Environmental Chemistry
Program and Abstracts

Faculty of Agriculture, Tokyo University of Agriculture and Technology, Fuchu, Tokyo.
July 31st, 2013 – Aug.2nd, 2013

Organized by Japan Society for Environmental Chemistry
Supported by Faculty of Agriculture, Tokyo University of Agriculture and Technology
Cooperated with SETAC Japan

主 催　日本環境化学会

後 援　東京農工大学農学部

協 力　SETAC Japan

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7 月 31 日（水） 1 日目　1A 会場（第 1 ブロック）　セッション 2　　13:20～14:35

マーカー物質

講演番号	演　題	発表者（所属）
1-1A-2-1	河川水中医薬品類の存在状況を指標とした諸外国都市河川流域の診断手法の検討	○中田 典秀 1，花本 征也 1，田中 宏明 1（1 京都大院・RCEQM）
1-1A-2-2	地下水への下水漏出評価法の検討 −水溶性難分解物質を指標にして−	○渡辺 裕太 1，折式田 崇仁 1，中田 晴彦 1，細野 高啓 2，利部 慎 1，小野 昌彦 1，徳永 貴大 1，嶋田 純 1（1 熊本大院・自然，2 熊本大院・先導）
1-1A-2-3	SMART WATERS：下水マーカーを用いたアフリカの水環境汚染の評価	○高田 秀重 1，小池 達也 1，Agyeman Siaw1，Ofosu-Anim John2，Sabi Edward2，Wasonga Oliver3，Newman Brent4，Weerts Steven4（1 東京農工大，2 ガーナ大，3 ナイロビ大，4 南アフリカ共和国科学産業研究会議）
1-1A-2-4	アジア大都市の大気エアロゾル中人為起源水素化レジン酸濃度・組成の比較	○熊田 英峰 1，青木 真里 1，奥田 知明 2，中島 典之 3，高田 秀重 4，畠山 史郎 4，内田 昌男 5，青木 元秀 1，藤原 祺多夫 1（1 東京薬科大・生命，2 慶応義塾大，3 東京大，4 東京農工大，5 国環研）
1-1A-2-5	琵琶湖堆積物中のペリレン含有断片の特徴	○伊藤 信靖 1，坂上 伸生 2，鳥村 政基 3，渡邊 眞紀子 4（1 産総研・計測標準，2 茨城大・農，3 産総研・環境管理，4 首都大東京）

7 月 31 日（水） 1 日目　1B 会場（第 1 ブロック）　セッション 2　　13:20～14:35

重金属・微量元素 （生体影響）

1-1B-2-1	バイカルアザラシの微量元素蓄積とその応答遺伝子の探索	○阿草 哲郎 1，平川 周作 2，渡邉 泉 3，池本 徳孝 4，宇高 真行 5，金 恩英 6，Petrov Evgeny7，Batoev Valeriy8，田辺 信介 1，岩田 久人 1（1 愛媛大・沿環研セ，2 福岡県保環研，3 東京農工大，4 サーモフィッシャーサイエンティフィック，5 愛媛県原子力セ，6Kyung Hee Univ , 7Eastern-Siberian Sci Prod Fish Ctr，8Baikal Inst Nat Manage SB RAS）
1-1B-2-2	ガーナの金鉱山周辺（オブアシ自治区）におけるヒ素汚染と陸生哺乳類への毒性影響評価	○大谷 豪 1（1 北海道大・獣医）
1-1B-2-3	水銀およびセレン化合物の淡水産生物に対する毒性	○西村 彩 1，南 有紀，中島 常憲 1，高梨 啓和 1，大木 章 1（1 鹿児島大院・理工）
1-1B-2-4	セレン蓄積性植物における有機セレン化合物の蓄積及び代謝機構の解析	○荻原 友里絵 1，徳本 真紀 1，阿南 弥寿美 1，小椋 康光 1（1 昭和薬科大）
1-1B-2-5	セレン蓄積性植物における無機テルル代謝機構の解明	○吉田 美雪 1，阿南 弥寿美 1，長谷川 早喜 1，徳本 真紀 1，小椋 康光 1（1 昭和薬科大）

July 31 (Wed) 1st day:　Room 1C　Session-2　　13:20～14:40

English session PPCPs etc

1-1C-2-1	GC-MS Determination and Risks Evaluation of Pharmaceuticals and Personal Care Products (PPCPs), and Phenolic Compounds in Rivers from India	○Ramaswamy BabuRajendran1, Shanmugam Govindaraj 1, Selvaraj Krishnakumar 1, Sampath Srimurali 1（1Bharathidasan Univ）
1-1C-2-2	Occurrence and Mass Flows of Fluorotelomer Alcohols in Municipal Sewage Treatment Plants: Comparison to Perfluorinated Carboxylic Acids	○HU Jianying1, PENG　Hui 1（1Coll Urban & Environ Sci, Peking Univ）

1-1C-2-3	Pollution Without Boundaries: River Danube, Serbia, Europe	○Vladimir P. Beskoski1,2, Shusuke Takemine3, Takeshi Nakano4, Latinka Slavkovic Beskoski5, Maija-Lisa Mattinen6, Gordana Gojgic-Cvijovic2, Miroslav M. Vrvic1,2（1Facul Chem, Univ Belgrade, Serbia, 2Inst Chem, Technol & Metall, Univ Belgrade, Serbia, 3Hyogo Pref Inst Environ Sci, 4Ctr Adv Sci & Innovation, Osaka Univ, 5Inst Nucl Sci "Vinca", Univ Belgrade, Serbia, 6VTT Bioprocessing, Espoo, Finland）
1-1C-2-4	Interactive International Pellet Watch: Integrating POPs monitoring and Risk Communication	○Yeo Bee Geok1, Takada Hideshige1, Taylor Heidi, Ito Maki, Hosoda Junki, Smith Wally（1Tokyo Univ Agri & Technol, 2Tangaroa Blue Found）

7 月 31 日（水）1 日目 2D 会場（第 2 ブロック） セッション 2 13:20～14:20

PCBs・POPs（分析法 2）

1-2D-2-1	有機顔料中 PCB 分析への絶縁油中の PCB 簡易定量法の適用	○高橋 知史 1（1 三浦工業）
1-2D-2-2	低濃度 PCB 含有廃棄物に関する測定方法（第 1 版）の分析例	○高橋 知史 1（1 三浦工業）
1-2D-2-3	低濃度 PCB 廃棄物の迅速処理を実現するフロー式イムノセンサを用いた直接希釈測定法	○立石 典生 1, 大島 重信 1, 高木 陽子 1（1 京都電子工業）
1-2D-2-4	GC/MS(NICI)による有機顔料中 PCB の簡易定量法	○佐藤 智行 1, 北原 祐輔 1, 網田 真一郎 1, 小林 厚 1, 森 正博 1, 佐藤 信俊 1, 鈴木 滋 1, 松 宏 1（1 東北緑化環境保全）

7 月 31 日（水）1 日目 2E会場（第 2 ブロック） セッション 2 13:20～14:35

臭素系難燃剤（分析法その他）

1-2E-2-1	臭素系難燃剤の物性推算と残留性および長距離移動性の評価	○倉持 秀敏 1, 滝上 英孝 1, Scheringer Martin2, 酒井 伸一 3（1 国環研, 2 スイス連邦工科大, 3 京都大）
1-2E-2-2	ポリスチレンフォーム廃棄物に含有される難燃剤ヘキサブロモシクロドデカンの燃焼分解挙動について	○滝上 英孝 1, 渡部 真文, 梶原 夏子（1 国環研・資源循環）
1-2E-2-3	超音波照射による臭素系難燃剤 HBCD の分解	○櫻井 明彦 1, 河野 将大 1, 叶 威 1（1 福井大院・工）
1-2E-2-4	LC-TOFMS による HBCD とその関連化合物の同定	○真名垣 聡 1, 呉 正根 2, 益永 茂樹 2, 佐藤 信武 3（1 武蔵野大, 2 横浜国大, 3 日本ウォーターズ）
1-2E-2-5	LC/MS/MS による臭素系難燃剤の分析法と調査	○大上 格 1, 鈴木 茂 1（1 中部大院・応用生物）

7 月 31 日（水）1 日目 1A 会場（第 1 ブロック） セッション 3 14:45～16:15

浄化・処理技術

講演番号	演 題	発表者（所属）
1-1A-3-1	鉄資材を用いたディルドリン分解における分解生成物の同定	○上田 祐子 1, 榊原 風太 2, 清田 洋正 3, 長島 優太 3, 髙木 和広 2, 本田 克久 1（1 愛媛大・農, 2 農環研, 3 東北大院・農）
1-1A-3-2	PCB 汚染変圧器洗浄剤の新規リサイクル技術の開発	○宮脇 和博 1, 福田 泰教 1,3, 加藤 栄一 1,3, 酒井 剛 2, 前川 仁知 2, 木田 敏之 3, 中野 武 3, 明石 満 3（1 ネオス中央研, 2 東京電力, 3 大阪大院・工）
1-1A-3-3	アミノ化フラーレンスートを用いた六価クロムの吸着除去	○中川 貴裕 1（1 信州大院・理工）
1-1A-3-4	酸化チタンを担持した石英繊維製フィルターによる大気エアロゾル粒子の無毒化	○本橋 一真 1, 関根 嗣晃 1, 池田 四郎 2, ノシャイヤ タノンサ 3, 関根 嘉香 1（1 東海大院・理, 2 東海大院・地球環境, 3Naresuan Univ）

1-1C-2-3

Pollution Without Boundaries: River Danube, Serbia, Europe

Vladimir P. Beškoski[1,2], Shusuke Takemine[3], Takeshi Nakano[4], Latinka Slavković Beškoski[5], Maija-Lisa Mattinen[6], Gordana Gojgić-Cvijović[2], Miroslav M. Vrvić[1,2]

([1]Faculty of Chemistry, University of Belgrade, Serbia, [2] Institute of Chemistry, Technology and Metallurgy, University of Belgrade, Serbia, [3]Hyogo Prefectural Institute of Environmental Sciences, Japan, [4]Center for Advanced Science and Innovation, Osaka University, Japan, [5]Institute of Nuclear Sciences "Vinča", University of Belgrade, Serbia, [6]VTT Bioprocessing, Espoo, Finland)

Introduction

Rivers in Southeast European country Serbia belong to the basins of the Black, Adriatic and Aegean Seas. The Black Sea drainage basin covers the area which occupies 92% of the territory of Serbia. The entire basin is drained only by the Danube River which flows into the Black Sea. The section of the Danube that flows through Serbia is 588 km long, out of the total of 2,872 km going through several European countries.

The main problems in Southeast Europe today are: the fact that municipal and industrial wastewater is often discharged into waterways without treatment; that a small number of plants for the treatment of industrial and municipal wastewater is built but not all of the existing facilities are in working order; and finally that disposal of waste in illegal dumps that are located near waterways is an obvious source of environmental pollution.

In the recent history some transboundary pollutions occurred such as a cyanide spill into the Someş River in Baia Mare, Romania in January 2000 caused by a gold mining company when about 100,000 m^3 of liquid containing 50-100 tonnes of cyanide, travelled into the river Danube before reaching the Black Sea [1]. Another is an Ajka alumina sludge spill in Western Hungary in October 2010 when about 700,000 m^3 of the red mud with a pH of about 12, that contains several toxic trace metals was released accidentally from the reservoir [2]. Because of biogeochemical activity of microorganisms in the zones of sulphide copper ores in the Eastern Serbia, Danube receives around 31 t of copper and 0.6 t of arsenic per annum from one place alone [3].

In Serbia, until recently there was no data about presence of perfluorinated compounds (PFCs) in the environment. We have analyzed PFCs in the sediment from wastewater canal (WWC) draining the industrial complex of Pančevo, (oil refinery, petrochemical plant, and fertilizer factory). WWC is artificial with no natural flows, about 2 km long, 70 m wide, water depth around 1–2 m and directly connected to the Danube River.

Materials and Methods

In total, 4 sediment samples from WWC were collected from the canal and for comparative purposes one from navigation canal flowing parallel to WWC but not receiving any direct discharge of industrial wastewaters.

Sampling sites were: 1 – navigation canal; 2 – the confluence of the WWC with the Danube River downstream from the industrial area and effluents; 3 – downstream from the fertilizer factory outlet (first); 4 – downstream from the petrochemical plant (second); 5 – downstream from the oil refinery outlet (third effluent).

Sediment sample was extracted with methanol. MPFAC-MXA as mass-labeled surrogates was spiked into the sample. The sample was extracted with SPE. The elution was concentrated and labeled $^{13}C_8$PFOA was added as

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Title of presentation: **Pollution Without Boundaries: River Danube, Serbia, Europe**

Speaker's lists: Vladimir P. Beškoski

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syringe spike. The each final solution was analyzed by liquid chromatography (LC)-tandem mass spectrometer (MS/MS) using Xevo TQ (Waters) coupled with ACQUITY UPLC (Waters). For MALDI-TOF-MS analysis, Autoflex II Bruker Daltonics, software flexControl, flexAnalysis and Maldi biotyper were used.

Results and Discussion

Concentrations of PFCs were determined and presented in Table 1 [4].

Table 1. PFCs content in the sediment samples from WWCV (%)

Sample	PFOA	PFHxA	PFHxS	PFOS	PFDS	ΣPFC (ng kg^{-1} dw)
1	12	-	39	49	-	588
2	4	-	-	96	-	2180
3	-	-	3	97	-	5470
4	2	3	-	90	5	6290
5	13	12	-	75	-	562

When the entire factory is in operation, the discharge is about 6,000 m^3 h^{-1} of wastewater. The total volume of water in the canal at the time of sampling was estimated to be around 32,000 m^3 and retention time in the canal is 6-9 h. A mass load of 1.38 kg PFOS per year discharged in the Danube River has been calculated, which undoubtedly points to the contribution to global pollution of Danube waters. The origin of PFCs might be their usage as components in pipes, fittings, wiring insulations and from firefighting foams.

Hydrocarbon degrading microorganisms isolated from WWC were identified based on the 16S rRNA gene analysis and furthermore analyzed using whole cell MALDI TOF-MS analysis. Isolated microorganisms belong to the genera *Brachybacterium sp*., *Rhodococcus sp.*, *Planomicrobium sp.*, *Micrococcus sp.*, *Planococcus sp.*, *Pseudomonas sp.,* and *Bacillus sp.* The results confirmed presence of different groups of microorganisms where each spectrum represents a fingerprint of individual microorganism (Figure 1).

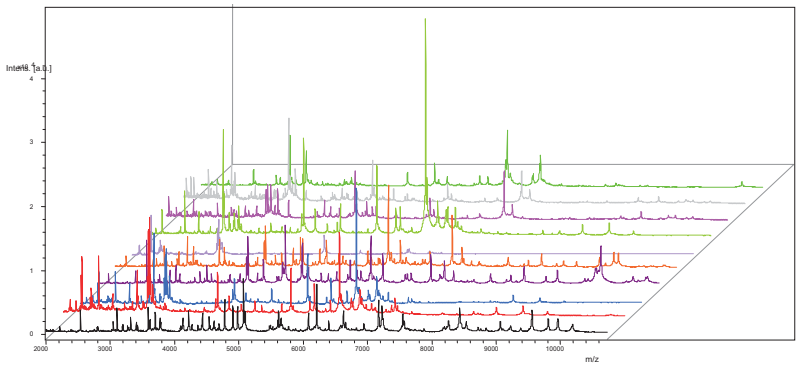

Figure 1. MALDI-TOF-MS spectra of intact bacterial cells isolated from Pančevo WWC

Since polychlorinated compounds [5] and some fluoro carbon compounds [6] are biodegradable it can be assumed that PFCs are also biodegradable. High microbial biodiversity in PFCs polluted samples indicates and support this assumption. Our future research will focus on (bio)transformation and (bio)degradation of these chemicals known as persistent and recalcitrant. This is very important since these pollutants are ubiquitous in the Danube River Basin, having strong influence on the environment and travel disregarding human borders.

References

[1] http://archive.rec.org/REC/Publications/CyanideSpill/ENGCyanide.pdf.

[2] http://pubs.acs.org/doi/abs/10.1021/es104000m.

[3] http://www.scientific.net/AMR.71-73.105.

[4] V.P. Beškoski et al., Chemosphere 91 (2013) 1408–1415.

[5] I. Twardowska et al. (eds.), Soil and Water Pollution Monitoring, Springer, (2006) 3–23, pp. 505-521.

[6] R.Natarajan, et al., J. Fluorine Chem. 126 (2005) 425–436.

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POLLUTION WITHOUT BOUNDARIES: RIVER DANUBE, SERBIA, EUROPE

Vladimir P. Beškoski[1,2], Shusuke Takemine[3], Takeshi Nakano[4], Latinka Slavković Beškoski[5], Maija-Lisa Mattinen[6], Gordana Gojgić-Cvijović[2], Miroslav M. Vrvić[1,2]

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Tokyo, July 31, 2013

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July 1, 2013

Dear Dr. Beškoski

I'm glad to inform that your application entitled "Pollution Without Boundaries: River Danube, Serbia, Europe" has been selected as the invited presentation to which financial support for your travel will be given. As announced earlier on the website, the financial support (up to 100,000 JPY) will cover air tickets, registration (10,000 JPY), accommodation (~8,000 JPY per night) and local trip fees. The financial support will cover the cost you required during the day before the conference (July 30) through August 2, depending on your travel schedule.

Please start to plan your travel to the conference in Fuchu-city, Tokyo, Japan. You will purchase the air tickets by yourself. We will refund the cost for the air ticket on the conference. Please keep the receipt, flight itinerary, and boarding pass and submit them to us when you request the reimbursement. The international session will be held between July 31 and August 2 in Fuchu, Tokyo. Between Fuchu and Narita international Airport, it takes about 2 hours by local train and bus. The organizing committee will arrange your accommodation with a reasonable price near the conference place. We will book the accommodation for you. In any way, we will contact with you via e-mail regarding logistics and the official abstract.

We are looking forward to seeing you and your talk at the conference. If you have any questions and requests, please do not hesitate to contact us via e-mail at jecint13@cc.tuat.ac.jp.

Best regards,

橋本 洋平

Yohey Hashimoto, Ph.D.
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