第 23 回 環境化学討論会

要旨集 CD

23rd Symposium on Environmental Chemistry

Abstracts CD

開催日時：2014 年 5 月 14 日～16 日

Dates: 14th — 16th May 2014

開催場所：京都大学百周年時計台記念館・芝蘭会館

Venue: Kyoto University, Kyoto, Japan

主催　日本環境化学会

Organised by Japan Society for Environmental Chemistry

May 14 (Wed.) Shiran-kaikan C (Yamauchi hall)　芝蘭会館 C 会場			
International Session 1 生体影響 農薬・炭化水素・PPCPs			
13:00	1C-01	Quantification of Neonicotinoids in Human Urine using Liquid Chromatography/ Tandem Mass Spectrometry	○Jemima Tiwaa Marfo 1, Yoshinori Ikenaka 1, Shouta Nakayama 1, Hazuki Mizukawa 1, Kumiko Taira 2, Kazutoshi Fujioka 3, Yoshiko Aoyama 4, Osei Akoto 5, Mayumi Ishizuka 1 (1; Hokkaido Univ., 2; Tokyo Women's Medical Univ., 3; Hawaii Institute of Molecular Education, 4; Aoyama Allergy Clinic, 5; Kwame Nkrumah Univ. of Sci. & Technol.)
13:20	1C-02	Methylated Polycyclic Aromatic Hydrocarbons and Their Contribution to AhR-mediated Activities in Street Dust from Vietnam and India	○Le Huu Tuyen 1,2, Nguyen Minh Tue 1,2, Shin Takahashi 4, Go Suzuki 3, Pham Hung Viet 2, Annamalai Subramanian 5, Kesav A.Bulbule 5, Shinsuke Tanabe 1 (1; CMES, Ehime Univ., 2; CETASD, Hanoi Univ. of Sci., 3; NIES, Japan, 4; Faculty of Agricultural Faculty, Ehime University, 5; KLE's Nijalingappa College, Bangalore, India)
13:40	1C-03	Occurrence of Micro-pollutants in Wastewater Effluents from Biogas Digester - Health Risk Assessment	○Le Thi Phuong Hong 1, Duong Thi Hanh 1, Chau Thi Cam Hong 2, Pham Duc Phuc 1, Nguyen Viet Hung 3, Kiwao Kadokami 2, Yoshiharu Shirane 4 (1; Hanoi School of Public Health, Vietnam, 2; University of Kitakyushu, Japan, 3; Swiss Tropical and Public Health Institute, Swizterland, 4; ShiranACE Ltd, Japan)
14:00	1C-04	Cancelled	
14:20	1C-05	Removal and Occurrence of Pharmaceuticals in Sludge and Wastewater from a Wastewater Treatment Plant in Korea	○Il-hoe Kim 1, Sang-jung Lee 2, Norihide Nakada 2, Hiroaki Tanaka 2, Ihn-sup Han 1 (1; Univ. of Seoul, 2; RCEQM, Kyoto Univ.)
International Session 2 生態系・環境レベル			
15:00	1C-06	Residue Levels and Health Risk Assessment of Organochlorine Pesticides (OCPs) in Domesticated Animals from Egypt	○Abdallah Fikry A. Mahmoud 1,2, Elsaid A. Eldaly 2, Alaa Eldin M.A. Morshdy 2, Yoshinori Ikenaka 1, Shouta Nakayama 1, Hazuki Mizukawa 1, Yared B. Yohannes 1, Waleed R. El-Ghareeb 2, Mohamed Tharwat El-Abbasy 2, Mayumi Ishizuka 1 (1; Hokkaido Univ., 2; Zagazig Univ.)
15:20	1C-07	Polybrominated Diphenyl Ethers (PBDEs): Occurrence and Debromination in Tropical Asian Countries	○Charita S. Kwan 1, Hideshige Takada 2, Kaoruko Mizukawa 2, Mahua Saha 2, Rinawati 3, Rei Yamashita 2, Ruchaya Boonyatumanond 4, Evangeline C. Santiago 1 (1; Natural Sci. Research Institute, Univ. of the Philippines, 2; Laboratory of Organic Geochemistry, Tokyo Univ. of Agri. & Technol., 3; Faculty of Math. & Natural Sci., Univ. of Lampung, Indonesia, 4; Env. Research and Training Center, Thailand)
15:40	1C-08	Australasia Pellet Watch: POPs Monitoring in Australia and New Zealand Using Plastic Resin Pellets with International Pellet Watch as a Tool for Effective Risk Communication	○Bee Geok Yeo 1, Hideshige Takada 1, Heidi Taylor 2, Maki Ito 1, Junki Hosoda 1, Wally Smith 2, Mayumi Allinson 3, Sharnie Connell 3, Laura Greaves, Mark Browne, Taj Powell, John McGrath 4 (1; Tokyo Univ. of Agri. & Technol., 2; Tangaroa Blue Foundation, 3; CAPIM, Univ. of Melbourne, 4; Surfrider Foundation Australia)
16:00	1C-09	The Ccapacity Building for Analysis and Reduction Measures of Persistent Organic Pollutants in Serbia	○Takeshi Nakano 1, Vladimir Beškoski 2 (1; Osaka Univ., 2; Belgrade Univ.)
16:20	1C-10	Potential Environmental Application of Microbial Polysaccharides	○Marijana Marković 1, Branka Kekez 2, Dragica Jakovljević 1, Gordana Gojgić-Cvijović 1, Dragan Manojlović 2, Vladimir Beškoski 2, Miroslav Vrvić 2 (1; Institute of Chemistry, Technol. & Metallurgy, Univ. of Belgrade, Serbia, 2; Faculty of Chemistry, Univ. of Belgrade, Serbia)

May 16 (Fri.) Shiran-kaikan C (Yamauchi hall)　芝蘭会館 C 会場

International Session 3 重金属汚染・PAH・ダイオキシン・環境レベル

10:15	3C-01	Present Status of Trace Elements Contamination in River and Marine Sediments and Fish from Jakarta Bay, Indonesia	○Adi Slamet Riyadi 1,2, Takaaki Itai 1, Tomohiko Isobe 1, Agus Sudaryanto 2, Muhammad Ilyas 2, Iwan Eka Setiawan 2, Shinsuke Tanabe 1 (1; CMES, Ehime Univ., 2; BPPT, Indonesia)
10:35	3C-02	A First Order Estimate of Total Metal(loid)s in Soil of e-Waste Recycling Site in Accral, Ghana	○Takaaki Itai 1, Asante Ansong Kwadwo 2, Akitoshi Goto 1, Samuel Obiri 2, Shin Takahashi 1,3, Shinsuke Tanabe 1 (1; CMES, Ehime Univ., 2; CSIR Water Research Institute, Ghana, 3; Dept. Agri., Ehime Univ.)
10:55	3C-03	Lead Pollution in the Children in Kabwe Mining Area, Republic of Zambia	○Shouta Nakayama 1, John Yabe 2, Yoshinori Ikenaka 1, Yared Beyene Yohannes 1, Balazs Oroszlany 1, Nesta Bortey-Sam 1, Kaampwe Muzandu 2, Kennedy Choongo 2, Abel Kabalo 3, John Ntapisha 3, Aaron Mweene 2, Takashi Umemura 1, Mayumi Ishizuka 1 (1; Hokkaido Univ., 2; Univ. of Zambia, 3; Kabwe District Health Office)
11:15	3C-04	Leaching of Arsenic from Tailings by Microbially Produced Rhamnolipids	○Vladimir P. Beškoski 1,2, Ivana Perić 2, Gordana Gojgić-Cvijović 2, Latinka Slavković Beškoski 3, Biljana Dojčinović 2, Miroslav M. Vrvić 1,2 (1; Faculty of Chemistry, Univ. of Belgrade, Serbia, 2; Institute of Chemistry, Technol. & Metallurgy, Univ. of Belgrade, Serbia, 3; Institute of Nuclear Sci. Vinca, Univ. of Belgrade, Serbia)
11:35	3C-05	Health Risk Assessment of Atmospheric Polycyclic Aromatic Hydrocarbons in Kumasi-Ghana	○Nesta Bortey-Sam 1, Yoshinori Ikenaka 1, Shouta Nakayama 1, Osei Akoto 2, Yared Beyene Yohannes 1, Hazuki Mizukawa 1, Mayumi Ishizuka 1 (1; Hokkaido Univ., 2; Kwame Nkrumah Univ. of Sci. & Technol., Ghana)
11:55	3C-06	Effect of Flocculating Agent on the Formation of Polychlorinated Dibenzodioxin and Dibenzofurans in Sewage Sludge Incineration	○Xiaoqing Lin, Xiaodong Li, Shengyong Lu, Fei Wang, Tong Chen, Jianhua Yan (Zhejiang Univ., China)

International Session 4 ダイオキシン・POPs・リン系塩素系難燃剤

13:45	3C-07	Dioxin in Vietnam	○Le Thi Hai Le, Nguyen Xuan Net, Le Ke Son (Office of National Steering Commitee 33, MONRE, Vietnam)
14:05	3C-08	Concentrations of Phosphorous Flame Retardants (PFRs) in Atmosphere, Bulk Deposition, and Soil in Kyoto, Japan	○Nguyen Thanh Dien 1, Yasuhiro Hirai 1, Toru Miyazaki 2, Shin-ichi Sakai 1 (1; Kyoto Univ., 2; Nippon Steel & Sumikin Technology)
14:25	3C-09	Evaluation of New & Legacy POPs Monitoring Techniques in Ambient Air and Results from Frequent Monitoring at Supersite, Japan	○Takumi Takasuga 1, Takeshi Nakano 2, Yasuyuki Shibata 3 (1; Shimadzu Techno-Research Inc., 2; Osaka Univ., 3; NIES)
14:45	3C-10	Determination of Atmospheric Dechlorane Plus in North-East Asia and Dietary Exposure Level in Japan	○ Kensaku Kakimoto 1,3, Kazuhiko Akutsu 1, Toshiki Tojo 2, Takanori Sakiyama 2, Yoshimasa Konishi 1, Keiji Kajimura 1, Kazuichi Hayakawa 3, Akira Toriba 3 (1; Osaka Prefectural Institute of Public Health, 2; Osaka City Institute of Public Health and Env. Sci., 3; Kanazawa Univ.)
15:05	3C-11	Oil Pollution Analysis Using Comprehensive GC-MS (GCxGC-MS)	○Haruhiko Miyagawa 1, Riki Kitano 1, Katsuhiro Nakagawa 1, Megumi Hirooka 1, Shunji Hashimoto 2, Vladimir P. Beškoski 3, Narayanan Kannan 4, Takeshi Nakano 5 (1; Shimadzu corporation, 2; NIES, 3; Faculty of Chemistry, Univ. of Belgrade, 4; Univ. Putra Malaysia, 5; Osaka Univ.)

日本環境化学会

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3C-04

Leaching of Arsenic from Tailings by Microbially Produced Rhamnolipids

○ Vladimir P. Beškoski[1,2], Ivana Perić[1], Gordana Gojgić-Cvijović[2], Latinka Slavković Beškoski[3], Biljana Dojčinović[2], Miroslav M. Vrvić[1,2]

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[Introduction]

With rapid industrial development, especially mining, and under the influence of many natural processes such as erosions, one of the main environmental and social problems became adverse impacts on health of toxic metals for all living organisms [1, 2, 3]. Particularly dangerous are soils, mine tailings and waste rocks, contaminated with As and other heavy metals. The total quantity of tailings and waste rock present and deposited in copper mines Bor and Majdanpek (East Serbia) is approximately 2 x 10^9 tons. It is estimated that if maximum concentrations of copper and arsenic and maximum capacity of the springs are considered from this area annually 31 tons of copper and 0.6 tons of As are released into the environment as a result of abiotic and biotic processes.

Rhamnolipids are anionic glycoside biosurfactants composed of one or two ramnose subunits, O-glycoside linked with one or two long fatty acid chains. Anionic and amphiphilic nature of rhamnolipids allows them to complex oppositely charged metals and by construction of micelles they increase mobilization and solubility of metals [2]. The focus of this study was to determine influence of microbial surfactants rhamnolipids on mobilization of heavy metals from the tailings and to estimate the use of rhamnolipids, as washing agents in pretreatment of metal contaminated substrates as preparation step before application of biohydrometallurgy for controlled leaching of tailings and waste rock.

[Methods]

Production and extraction of rhamnolipids: Rhamnolipids were produced by *Pseudomonas aeruginosa* D3 (Genbank JN995664), isolated from petroleum polluted soil. Fermentation on PPGAS medium lasted 4 days, 28°C on the orbital shaker. Biomass was separated by centrifugation and crude rhamnolipid mixture was obtained by organic solvent extraction.

Characterization of Bor tailing sample: Physico-chemical and ICP-OES characterization of tailings from copper mine Bor was conducted.

Leaching experiments: Successive batch and continuous column elution effects were examined. Using successive batch method the efficiency of different concentrations of rhamnolipids (0.05%, 0.1% and 0.15%) in NaOH solution (pH=11) on extraction of metals from tailing sample were studied. The ratio of solid and liquid phase was in the range from 1:10 through 1:30, and after overnight extraction on the orbital shaker the supernatants were digested and analysed using ICP-OES. Five successive elutions with the same volume of rhamnolipids solution were used. For continuous column elution, plastic column was packed with a layer of glass wool, quartz sand and Bor tailing. The first column was eluted by 5 volumes of NaOH solution (pH=11) were each volume continuously circulated 4 times through the column. The second column was eluted by 5 volumes of 0.1% rhamnolipid solution in NaOH (pH=11) where each volume continuously circulated 4 times through the column. The collected samples were concentrated, digested with HNO_3 and analysed using ICP-OES.

[Results and discussion]

Obtained yield of crude rhamnolipids amounted to ≈0.5 g/L. The total content of As, Cu, Co, Cr, Pb, Sr, Sn, Ti, Zn in the Bor tailings was 64, 2091, 49, 607, 409, 97, 1534, 432, 2772 mg/kg respectively, with more than 50 g/kg Fe and the total sulphur 6%. The tailings pH was 8.3, in dH_2O 1:2.5 (w/v). An experiment with different rhamnolipid concentrations showed that the highest leaching of As was obtained by 0.1% rhamnolipid solution. Also, leaching of other heavy metals, such as Cu, Pb and Sr, were higher with 0.1% rhamnolipid solution compared to the concentration leached with other rhamnolipid solutions. A successive batch elution study showed that leaching of As was reduced with each subsequent elution with used 0.1% rhamnolipid solution (Table 1). Successive elution increases removal of metals, such as Fe, Zn and Sn, while the extraction of Cu and Pb was reduced. Successive elution in the column showed that the higher amount of As was leached with 0.1% rhamnolipid solution compared with the control solution (NaOH, pH=11) and the amount of leached As and other heavy metals (Co, Zn, Cd, Mo) increased with each subsequent elution. However, metals like Ni, Cu and Se, showed reduced extraction with successive column elution.
The total amount and percentage of leached As in the batch study was almost 10x higher comparing to successive column elution and excited 10% of total As (Table 2).

Table 1. Successive batch and column extraction/elution of As (mg/kg) with NaOH (pH=11) and 0.1% rhamnolipid solution in NaOH (pH=11)

	Extraction	**1st**	**2nd**	**3rd**	**4th**	**5th**
Column elution, 1:10 (w/v)	Control	0.10±0.02	0.08±0.02	0.07±0.02	0.08±0.02	0.10±0.02
	0.1% Rhl	0.10±0.03	0.18±0.03	0.16±0.03	0.16±0.03	0.20±0.03
Batch extraction, 1:30 (w/v)	Control	0.24±0.02	0.43±0.02	0.20±0.02	0.22±0.02	0.13±0.02
	0.1% Rhl	2.53±0.05	1.75±0.05	1.15±0.05	1.19±0.05	0.75±0.05

Table 2. Total amount and percentage of leached As in successive column and batch elution/extraction with NaOH (pH=11) and 0.1% rhamnolipid solution in NaOH (pH=11)

		As [mg/kg]	**As [%]**
Column elution	Control	0.4	0.6
	0.1% Rhl	0.8	1.3
Batch extraction	Control	1.2	1.9
	0.1% Rhl	7.4	11.6

[Conclusion]

This study showed that the highest leaching of As is obtained in extraction with 0.1% rhamnolipid solution and the same effect has been noted for Pb, Cu and Sr. Sequential batch and column elution increases removal of As, which is followed by increased removal of some other metals, such as Zn, Co, Cd, Mo and reduces removal of Pb, Cu and Ni. This study suggest that microbial rhamnolipids have strong influence on mobilizing heavy metals from tailings, but also that rhamnolipids can be used for treatment that precedes biohydrometallurgical technologies.

[References]

[1] M. Pacwa-Plociniczak, G.A. Plaza, Z. Piotrowska-Seget, S.S. Cameotra, *Int. J. Mol. Sci.* **12** (2011) 633

[2] A.A. Juwarkar, A. Nair, K.V. Dubey, S.K. Singh, S. Devotta, *Chemosphere* **68** (2007) 1996

[3] S. Wang, C.N. Mulligan, *Process Biochem.* **44** (2009) 296