

June 1, 2008

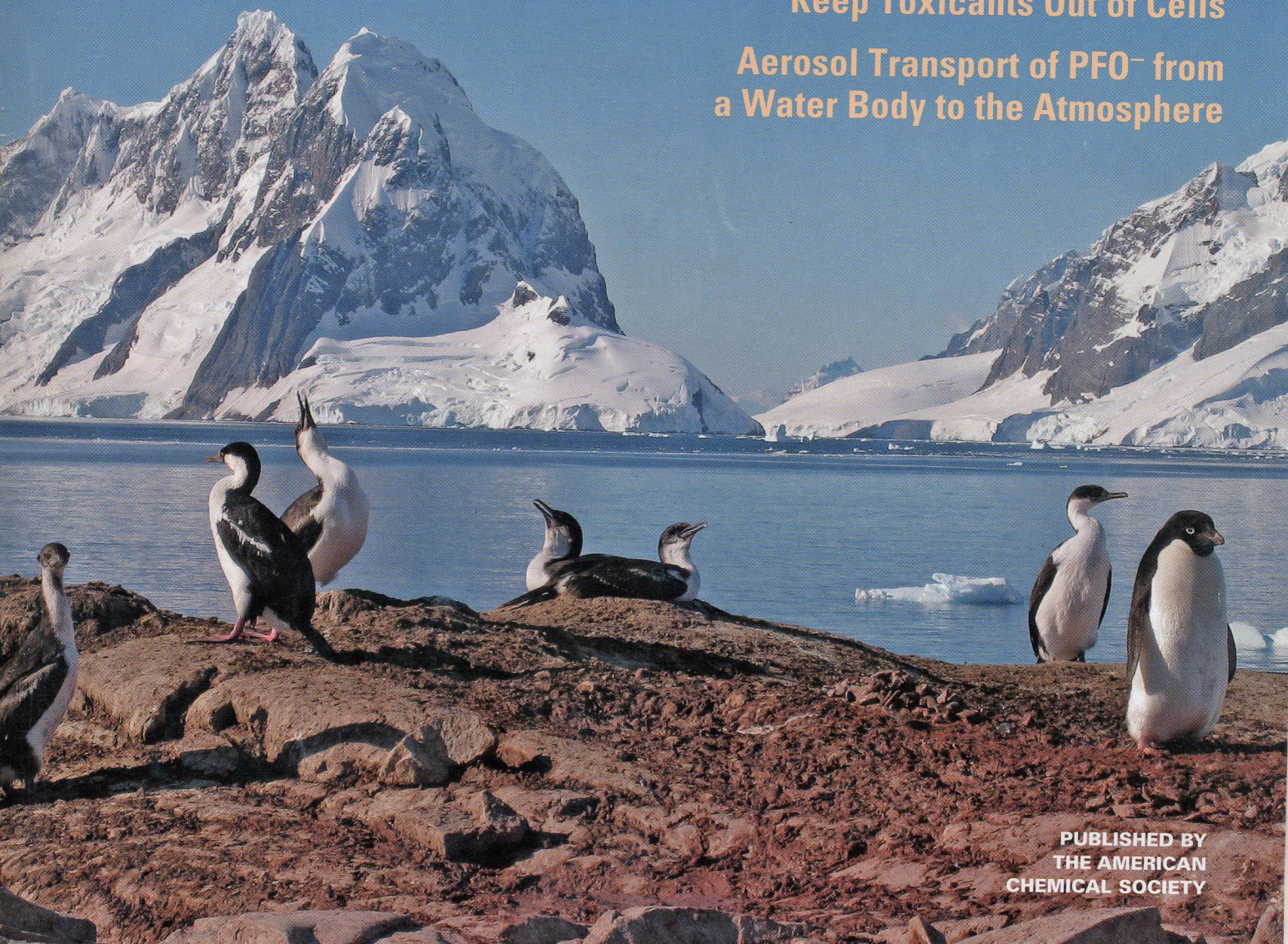
ENVIRONMENTAL Science & Technology

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DDT LEVELS in Antarctic Penguins

Efflux Transporters Help
Keep Toxicants Out of Cells

Aerosol Transport of PFO⁻ from
a Water Body to the Atmosphere



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CRITICAL REVIEW

3921

Review: Direct and Indirect Electrical Stimulation of Microbial Metabolism

J. Cameron Thrash and John D. Coates*

A review detailing the literature in the field of applied power bioelectrochemical systems for the stimulation of microbial processes.

CHARACTERIZATION OF NATURAL AND AFFECTED ENVIRONMENTS

■ 3932

Chloride Chemical Form in Various Types of Fly Ash

Fenfen Zhu,* Masaki Takaoka, Kenji Shiota, Kazuyuki Oshita, and Yoshinori Kitajima

The method of combining XANES with XRD is successfully applied to identify chloride speciation and corresponding quantitative distribution in three kinds of fly ash.

■ 3938

Ozone Levels in Passenger Cabins of Commercial Aircraft on North American and Transoceanic Routes

Seema Bhangar, Shannon C. Cowlin, Brett C. Singer, Richard G. Sextro, and William W. Nazaroff*

In-cabin ozone levels, varying by season and with episodic storms, can be elevated on domestic U.S. flights and are effectively reduced by ozone converters.

■ 3944

Carbonyl and Nitrogen Dioxide Emissions From Gasoline- and Diesel-Powered Motor Vehicles

George A. Ban-Weiss, John P. McLaughlin, Robert A. Harley,* Andrew J. Kean, Eric Grosjean, and Daniel Grosjean

Emissions of carbonyls and NO₂ from gasoline- and diesel-powered motor vehicles are measured in a San Francisco Bay area highway tunnel.

■ 3951

Rapid Dissolution of Soluble Uranyl Phases in Arid, Mine-Impacted Catchments near Church Rock, NM

Jamie L. deLemos,* Benjamin C. Bostick, Andrew N. Quicksall, Joshua D. Landis, Christine C. George, Naomi L. Slagowski, Tommy Rock, Doug Brugge, Johnnye Lewis, and John L. Durant

A geochemical investigation of uranium in the Church Rock mining district of New Mexico reveals that highly soluble uranyl minerals are present in exposed waste sources.

ENVIRONMENTAL PROCESSES

■ 3958

Melting Glaciers: A Probable Source of DDT to the Antarctic Marine Ecosystem

Heidi N. Geisz,* Rebecca M. Dickhut, Michele A. Cochran, William R. Fraser, and Hugh W. Ducklow

ΣDDT has not declined in Adélie penguins in >30 years, indicating that there is a current source of DDT to the Antarctic marine food web.

■ 3963

Correlating TMP Increases with Microbial Characteristics in the Bio-Cake on the Membrane Surface in a Membrane Bioreactor

Byung-Kook Hwang, Woo-Nyoung Lee, Kyung-Min Yeon, Pyung-Kyu Park, Chung-Hak Lee,* In-Soung Chang, Anja Drews, and Matthias Kraume

The one-stage increase in TMP is attributed to the accumulation of microbial flocs and the reduced porosity of the bio-cake, whereas the two-stage increase is attributed to the spatial and temporal changes of EPS concentration.

■ 3969

Aerosol Enrichment of the Surfactant PFO and Mediation of the Water–Air Transport of Gaseous PFOA

Colin J. McMurdo, David A. Ellis,* Eva Webster, Jessica Butler, Rebecca D. Christensen, and Lisa K. Reid

The water–air emission of PFOA via aerosol formation is experimentally shown and indicates that water bodies are not a permanent sink for PFOA as was previously believed.

■ 3975

Abiotic Transformation of Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) by Green Rusts

Philip Larese-Casanova and Michelle M. Scherer*

RDX is rapidly transformed to HCHO, N₂O, and NH₄⁺ in the presence of green rusts, but some common groundwater anions, such as phosphate, result in significantly slower rates of transformation.

3982

Size and Biomagnification: How Habitat Selection Explains Beluga Mercury Levels

L. L. Loseto,* G. A. Stern, and S. H. Ferguson*

The beluga mercury body burden is determined by biomagnification processes associated with body size related to habitat selection.

■ 3989

Absorption or Adsorption? Insights from Molecular Probes *n*-Alkanes and Cycloalkanes into Modes of Sorption by Environmental Solid Matrices

Satoshi Endo,* Peter Grathwohl, and Torsten C. Schmidt

Characteristic relative sorption behavior of *n*-alkanes and cycloalkanes may suggest the mode of sorption in environmental phases.

■ 3996

Diastereoisomer- and Enantiomer-specific Profiles of Hexabromocyclododecane in the Atmosphere of an Urban City in South China

Zhiqiang Yu,* Laiguo Chen, Bixian Mai, Minghong Wu, Guoying Sheng, Jiamo Fu, and Ping'an Peng

Mean atmospheric hexabromocyclododecane concentrations in Guangzhou range from 0.69 to 3.09 pg/m³, similar to levels reported in the U.S., but significantly lower than in Europe.

■ 4002

Mechanism of Influence of Initial pH on the Degradation of Nitrobenzene in Aqueous Solution by Ceramic Honeycomb Catalytic Ozonation

Lei Zhao,* Jun Ma,* Zhizhong Sun, and Xuedong Zhai

Conversion of initial pH can cause the evolution of pH_{PZC}, leading to a change in degradation of nitrobenzene.

4008

Copper(II) and Cadmium(II) Sorption onto Ferrihydrite in the Presence of Phthalic Acid: Some Properties of the Ternary Complex

Yantao Song, Peter J. Swedlund,* and Naresh Singhal

The metal ion (Cu²⁺, Cd²⁺)-phthalic acid-ferrihydrite system is examined, and by comparison with previous studies, several properties of ternary complexes on ferrihydrite are proposed.

■ 4014

Metal Binding by Heterogeneous Ligands: Kinetic Master Curves from SSCP Waves

Raewyn M. Town

SSCP is shown to be a powerful tool for sampling the low metal-to-ligand ratio domain of the distribution of kinetic binding parameters for heterogeneous complexants.

ENVIRONMENTAL MODELING

■ 4022

How Much Will China Weigh? Perspectives from Consumption Structure and Technology Development

Ming Xu, Tianzhu Zhang,* and Braden Allenby

The physical dimension of China's development is discussed and its future in terms of resource requirement and waste generation is explored.

■ 4029

Multivariate Soft-Modeling To Predict Radiocesium Soil-to-Plant Transfer

Anna Rigol,* Marta Camps, Anna De Juan, Gemma Rauret, and Miquel Vidal

Multivariate soft-modeling is tested and proposed as an alternative to hard-modeling for predicting radiocesium transfer to grass in natural meadows using soil and plant characteristics.

4037

Underestimation of Uncertainty in Statistical Regression of Environmental Models: Influence of Model Structure Uncertainty

Marc B. Neumann and Willi Gujer*

The influence of model structure deficiencies on parameter uncertainty estimates when applying statistical inference to environmental systems is investigated.

■ 4044

Source Apportionment of Polychlorinated Biphenyls in the Tidal Delaware River

Songyan Du, Thomas J. Belton, and Lisa A. Rodenburg*

Positive matrix factorization is used to apportion polychlorinated biphenyl sources in the Delaware River.

■ 4052

Modeling the Potential Influence of Particle Deposition on the Accumulation of Organic Contaminants by Submerged Aquatic Vegetation

James M. Armitage, Amaya Franco, Sonia Gomez, and Ian T. Cousins*

A mechanistically based environmental fate model is used to investigate the importance of including particle deposition for describing the accumulation of organic contaminants by submerged aquatic vegetation.

■ 4060

Environmental Decision Support for the Construction of a "Green" Mountain Hut

Melanie Goymann, Mathias Wittenwiler, and Stefanie Hellweg*

A prospective environmental assessment of a mountain hut is performed to support environmental decision making in the early design phase of the building.

ENVIRONMENTAL MEASUREMENTS METHODS

■ 4068

Optimization of a Multiresidual Method for the Determination of Waterborne Emerging Organic Pollutants Using Solid-Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry and Isotope Dilution Mass Spectrometry

Chunyan Hao, Xiaoming Zhao, Shahram Tabe, and Paul Yang*

Method performance of multiresidue, LC/isotope dilution MS-MS analysis of 51 emerging organic pollutants in environmental waters and root cause analysis of matrix effect.

■ 4076

An Exchange Method To Investigate the Kinetics of Cd Complexation in Soil Solutions

André Schneider

The method permits the estimation of the association and dissociation rate constants of an assumed single metal complex in soil solutions.

4083

Radioiodination of Humic Substances via Azocoupling with 3-[¹²⁵I]Iodoaniline

Karsten Franke,* Jörg T. Patt, Hermann Kupsch, and Peter Warwick

A new method is described for radiolabeling humic substances with iodine radioisotopes.

REMEDIATION AND CONTROL TECHNOLOGIES

■ 4088

Preparation of Electrotechnical Products for Reduction of Hazardous Substances Compliance Testing

Damian B. Gore,* Erika S. Heiden, and Russell J. Field

Inhomogeneous electrotechnical materials such as printed circuit boards must be shredded prior to analysis for RoHS compliance assessment.

■ 4093

Physiological and Transcriptional Responses of *Nitrosomonas europaea* to Toluene and Benzene Inhibition

Tyler S. Radniecki,* Mark E. Dolan, and Lewis Semprini

The physiological and transcriptional responses of *Nitrosomonas europaea* to benzene, toluene, and their oxidized daughter products are examined using microarrays, qRT-PCR and transmission electron microscopy.

■ 4099

Effects of Enrichment with Salicylate on Bacterial Selection and PAH Mineralization in a Microbial Community from a Bioreactor Treating Contaminated Soil

Sabrina N. Powell, David R. Singleton, and Michael D. Aitken*

Salicylate addition increases the abundance of salicylate-degrading bacteria by several orders of magnitude and enhances the mineralization of naphthalene, but not phenanthrene or benzo[*a*]pyrene.

4106

Rapid Dechlorination of Polychlorinated Dibenzo-*p*-dioxins by Bimetallic and Nanosized Zerovalent Iron

Ji-Hun Kim, Paul G. Tratnyek, and Yoon-Seok Chang*

Rapid dechlorination of PCDDs is achieved with palladized ZVI, and the mechanisms for PCDD dechlorination by ZVI and palladized ZVI are proposed.

4113

Spatial and Temporal Evolution of Biogeochemical Processes Following In Situ Capping of Contaminated Sediments

David W. Himmelheber, Martial Taillefert, Kurt D. Pennell, and Joseph B. Hughes*

Geochemical profiling with voltammetric microelectrodes demonstrates that sediment capping induces a vertical shift of stratified biogeochemical processes into the overlying cap, potentially impacting contaminant behavior.

■ 4121

Design and Implementation of a Continuous Microwave Heating System for Ballast Water Treatment

Dorin Boldor,* Sundar Balasubramanian, Shreya Purohit, and Kelly A. Rusch

Presentation of a novel treatment technology of ballast water from ocean-going ships using electromagnetic energy to prevent introduction of invasive species in native coastal waters.

■ 4128

Laboratory and On-Road Evaluations of Cabin Air Filters Using Number and Surface Area Concentration Monitors

Chaolong Qi,* Nick Stanley, David Y. H. Pui, and Thomas H. Kuehn

Laboratory and on-road evaluations of cabin air filters are studied in a wind tunnel and using vehicle on-road tests.

■ 4133

▶ Nanoparticle Silver Released into Water from Commercially Available Sock Fabrics

Troy M. Benn* and Paul Westerhoff

Nanosilver leached from commercial sock material is quantified and characterized, and its treatment in a wastewater treatment plant is modeled.

■ 4140

Selective Sorption of Lead, Cadmium and Zinc Ions by a Polymeric Cation Exchanger Containing Nano-Zr(HPO₃S)₂

Qingrui Zhang, Bingcai Pan,* Bingjun Pan, Weiming Zhang, Kun Jia, and Quanxing Zhang

A nano-Zr(HPO₃S)₂-loaded polymeric cation exchanger is fabricated for highly selective removal of heavy metals from waters.

SUSTAINABILITY ENGINEERING AND GREEN CHEMISTRY

■ 4146

Electricity Generation by *Rhodospseudomonas palustris* DX-1

Defeng Xing, Yi Zuo, Shaoan Cheng, John M. Regan, and Bruce E. Logan*

Photosynthetic *Rhodospseudomonas palustris* DX-1 produces electricity at higher power densities than mixed cultures in the same solutions and microbial fuel cell.

■ 4152

Energy Balance and Emissions Associated with Biochar Sequestration and Pyrolysis Bioenergy Production

John L. Gaunt* and Johannes Lehmann

Compared to its use as an energy source biochar produced by slow pyrolysis is more effective in reducing greenhouse gas emissions when used as a soil conditioner.

4159

Development of an Eco-Friendly Material Recycling Process for Spent Lead Glass Using a Mechanochemical Process and Na₂EDTA Reagent

Ryo Sasai,* Hisashi Kubo, Masahiro Kamiya, and Hideaki Itoh

This paper demonstrates that lead-glass powder, used in CRTs, protective glass, etc., can be recycled at room temperature and normal pressure.

4165

Biosynthesis of Nanocrystal Akaganéite from FeCl₂ Solution Oxidized by *Acidithiobacillus ferrooxidans* Cells

Huixin Xiong, Yuehua Liao, Lixiang Zhou,* Yiqun Xu, and Shimei Wang

Nanocrystal akaganéite, a potentially effective sorbent for toxic elements, has been biosynthesized for the first time through oxidation of FeCl₂ solution by *Acidithiobacillus ferrooxidans*.

■ 4170

Thermal Activation of CaO-Based Sorbent and Self-Reactivation during CO₂ Capture Looping Cycles

Vasilije Manovic and Edward J. Anthony*

The paper presents the phenomenon of self-reactivation of CaO-based sorbents during looping cycles proposed for mitigation of CO₂ emissions from fossil fuel combustion.

ECOTOXICOLOGY AND HUMAN ENVIRONMENTAL HEALTH

■ 4175

Mechanisms of Photochemistry and Reactive Oxygen Production by Fullerene Suspensions in Water

Ernest M. Hotze, Jerome Labille, Pedro Alvarez, and Mark R. Wiesner*

A mechanism for photosensitized reactive oxygen species generation by fullerene and fullerol nanomaterials aggregated in aqueous suspension is linked with the nanomaterial's aggregation state.

■ 4181

Changes in Blubber Contaminant Concentrations in California Sea Lions (*Zalophus californianus*) associated with Weight Loss and Gain during Rehabilitation

A. J. Hall,* F. M. D. Gulland, G. M. Ylitalo, D. J. Greig, and L. Lowenstine

The mass balance of POP contaminants in California sea lions during rapid mass loss and gain reveals retention and elimination differs by compound structure.

■ 4188

Investigating Compensation and Recovery of Fathead Minnow (*Pimephales promelas*) Exposed to 17 α -Ethinylestradiol with Metabolite Profiling

D. R. Ekman,* Q. Teng, D. L. Villeneuve, M. D. Kahl, K. M. Jensen, E. J. Durhan, G. T. Ankley, and T. W. Collette

Liver metabolite profiling of male fathead minnows reveals feminization and subsequent compensation following EE2 exposure.

4195

Human Exposure to Polychlorinated Naphthalenes and Polychlorinated Diphenyl Ethers from Foods in Catalonia, Spain: Temporal Trend

Roser Martí-Cid, Juan M. Llobet, Victoria Castell, and José L. Domingo*

During 2000–2006, a reduction of 84% and an increase of 26% were found in the dietary intake of PCNs and PCDEs, respectively, in Catalonia, Spain.

4202

Elevated Levels of Urinary 8-Hydroxy-2'-deoxyguanosine in Male Electrical and Electronic Equipment Dismantling Workers Exposed to High Concentrations of Polychlorinated Dibenzo-*p*-dioxins and Dibenzofurans, Polybrominated Diphenyl Ethers, and Polychlorinated Biphenyls

Sheng Wen, Fang-Xing Yang, Yan Gong, Xiao-Ling Zhang, Yang Hui, Jing-Guang Li, Ai-Ling Liu, Yong-Ning Wu, Wen-Qing Lu, and Ying Xu*

Elevated urinary 8-OHdG levels indicate a high cancer risk in the E-waste dismantling workers exposed to high concentrations of PCDD/Fs, PBDEs, and PCBs.

4208

Comparative Transcriptomic Responses to Chronic Cadmium, Fluoranthene, and Atrazine Exposure in *Lumbricus rubellus*

C. Svendsen, J. Owen, P. Kille, J. Wren, M. J. Jonker, B. A. Headley, A. J. Morgan, M. Blaxter, S. R. Stürzenbaum, P. K. Hankard, L. J. Lister, and D. J. Spurgeon*

Toxicogenomics indicates a minimum commonality that is based mostly on mitochondrial-associated gene expression changes following multiple chemical exposures.

4215

Sediment Toxicity of a Rapidly Biodegrading Nonionic Surfactant: Comparing the Equilibrium Partitioning Approach with Measurements in Pore Water

Steven T. J. Droge,* Jaap F. Postma, and Joop L. M. Hermens

EqP works for alcohol ethoxylate in fully equilibrated sediment systems, but not for *Corophium volutator* when biodegradation causes a lower chemical activity in overlying water.

4222

Linking PBDEs in House Dust to Consumer Products using X-ray Fluorescence

Joseph G. Allen,* Michael D. McClean, Heather M. Stapleton, and Thomas F. Webster

Television and furniture bromine content are associated with decaBDE and pentaBDE concentrations in dust, indicating a link between sources and indoor exposure.

4229

PAHs, PAH-Induced Carcinogenic Potency, and Particle-Extract-Induced Cytotoxicity of Traffic-Related Nano/Ultrafine Particles

Chih-Chung Lin, Shui-Jen Chen,* Kuo-Lin Huang, Wen-Jhy Lee, Wen-Yinn Lin, Jen-Hsiung Tsai, and Hso-Chi Chaung*

PAH content, PAH-induced carcinogenic potency, and particle-extract-induced cytotoxicity are found to be significantly higher for nano/ultrafine particles than for coarser particles collected near a busy road.

ADDITIONS AND CORRECTIONS

4236

Correlation of Respiratory Gene Expression Levels and Pseudo-Steady State PCE Respiration Rates in *Dehalococcoides ethenogenes*

Brian G. Rahm and Ruth E. Richardson*

Supporting information is available free at <http://pubs.acs.org/est>.
This research is highlighted in the News and Features section.