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# ENVIRONMENTAL Science & Technology

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## **Submarine Groundwater Discharge *as a Source of* MERCURY *to* Coastal Waters**

**Brominated Dibenzo-*p*-Dioxins:  
A New Class of Marine Toxins?**

**The Roles of State and Federal  
Mobile-Source Emissions Standards**

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## News and Features

### 3031 Comment

Coral reef canary

## NEWS

### 3032 Mercury from underground estuary

Researchers have found a potential new source of the toxic metal in marine environments.

### 3033 Another toxin for the Baltic Sea?

Scientists have identified a new class of naturally produced marine toxins that may add to the dioxin load of Baltic Sea animals.

### 3033-3037 News Briefs

Australia in a new light • Forcing water through nanotubes • Selenium: a potential mercury shield? • EPA nanotech report • Toxic waste and race • Environmental costs of organic food

### 3034 Scaling up microbial fuel cells

Advances in anodes and cathodes move microbial fuel cells closer to practical uses.

### 3035 Taking out nitrates with a self-sufficient MFC

Microbes completely denitrify wastewater while making electricity, without the need for external energy.

### 3036 Models reveal pesticide exposure routes

Combining modeling with biomonitoring data reveals pesticide exposure routes in pregnant Latina women in the Salinas Valley, Calif.

### 3038 Technology Solutions

High-efficiency solar cells come down to earth

## FEATURE

### 3040 The Roles of State and Federal Mobile-Source Emissions Standards

K. John Holmes, David Allen, and Matthew Russell



California and other states with air-quality problems can require vehicles and other engines sold within the state to meet emissions standards that are stricter than the federal ones. Recently, Congress requested the National Research Council (NRC) to examine the impact of this policy design.

The NRC Committee on State Practices in Setting Mobile Source Emissions Standards describes its findings in the report *State and Federal Standards for Mobile-Source Emissions*. Holmes et al. highlight various aspects of that report.

**Cover:** The aerial image (in false color) of Waquoit Bay, Mass., reveals the extent of groundwater seepage in this coastal environment. Photo provided by Matt Charette of Woods Hole Oceanographic Institution.

**Online news:** Read news first at <http://pubs.acs.org/estnews>.

## Research

### POLICY ANALYSIS

#### 3047

### Information Flow and Its Significance in Coherently Integrated Policymaking for Promoting Energy Efficiency

Harn Wei Kua

A coherently integrated policymaking process is described that promotes stakeholder communication to avoid negative, unexpected policy outcomes.

### CHARACTERIZATION OF NATURAL AND AFFECTED ENVIRONMENTS

#### ■ 3055

### Latitudinal Gradient of Airborne Polyfluorinated Alkyl Substances in the Marine Atmosphere between Germany and South Africa (53° N–33° S)

Annika Jahnke, Urs Berger, Ralf Ebinghaus, and Christian Temme

A ship-based air sampling campaign reveals a strongly decreasing concentration gradient of polyfluorinated alkyl substances between Bremerhaven, Germany, and Cape Town, Republic of South Africa.

#### ■ 3062

### Long-Term Fate of a Pulse Arsenic Input to a Eutrophic Lake

David B. Senn, James E. Gaweł, Jennifer A. Jay, Harold F. Hemond, and John L. Durant

Legacy arsenic in sediments is an ongoing arsenic source to a lake's water column.

#### ■ 3069

### Brominated Dibenzo-*p*-Dioxins: A New Class of Marine Toxins?

Peter Haglund, Anna Malmvärn, Sture Bergek, Anders Bignert, Lena Kautsky, Takeshi Nakano, Karin Wiberg, and Lillemor Asplund

The levels of polybrominated dibenzo-*p*-dioxins in blue mussels and littoral fish from the Baltic Proper exceed those of their chlorinated analogues.

#### 3075

### Prestige Oil Spill. III. Fate of a Heavy Oil in the Marine Environment

Sergi Diez, Eric Jover, Josep M. Bayona, and Joan Albaigés

A survey of oil residues after the *Prestige* spill shows the low incidence of weathering on the spilled heavy oil and the occurrence of other discharges in the area.

#### ■ 3083

### Lipid Reserve Dynamics and Magnification of Persistent Organic Pollutants in Spawning Sockeye Salmon (*Oncorhynchus nerka*) from the Fraser River, British Columbia

Barry C. Kelly, Samantha L. Gray, Michael G. Ikononou, J. Steve Macdonald, Stelvio M. Bandiera, and Eugene G. Hryciak

Dramatic changes in lipid reserves during upstream spawning migration affect tissue residue concentrations, toxicokinetics, and hence the potential toxicity of POPs in sockeye salmon.

■ Supporting information is available free at <http://pubs.acs.org/est>.  
▶ This issue contains a news story about this research.

■ 3090

► **Has Submarine Groundwater Discharge Been Overlooked as a Source of Mercury to Coastal Waters?**

Sharon E. Bone, Matthew A. Charette, Carl H. Lamborg, and Meagan Eagle Gonneea

The role of submarine groundwater discharge in the transport of dissolved mercury is assessed.

■ 3096

**Composition of Dioxin-like PCBs in Fish: An Application for Risk Assessment**

Satyendra P. Bhavsar, Rachael Fletcher, Alan Hayton, Eric J. Reiner, and Donald A. Jackson

Using the largest known dioxin-like PCB (dl-PCB) fish dataset, we show that the dl-PCB composition is relatively stable, regardless of fish species and total PCB level.

■ 3103

**Diffusion of PAH in Potato and Carrot Slices and Application for a Potato Model**

Stefan Trapp, Anita Cammarano, Ettore Capri, Fredrik Reichenberg, and Philipp Mayer

The permeabilities of four PAHs in carrot and potato tissue are measured and applied to a model for the prediction of the bioconcentration of chemicals in potatoes grown in soil.

■ 3109

**Trophic Dilution of Polycyclic Aromatic Hydrocarbons (PAHs) in a Marine Food Web from Bohai Bay, North China**

Yi Wan, Xiaohui Jin, Jianying Hu, and Fen Jin

The trophodynamics of 18 PAHs in a marine food web are determined.

■ 3115

**Aircraft Measurement of Organic Aerosols over China**

Gehui Wang, Kimitaka Kawamura, Shiro Hatakeyama, Akinori Takami, Hong Li, and Wei Wang

Organic aerosols in the lower to middle (0.3–5 km) troposphere over China are characterized on a molecular level, together with their spatial and seasonal distributions.

■ 3121

**Daily and Peak 1 h Indoor Air Pollution and Driving Factors in a Rural Chinese Village**

Susan L. Fischer and Catherine P. Koshland

Heating fuel and household smoking status are significant predictors of indoor air quality; the use of gas or electric fuel for cooking is associated with poorer air quality in peak and daily measures.

■ 3127

**Occurrence of 2,4-Dichlorophenol and of 2,4-Dichloro-6-Nitrophenol in the Rhône River Delta (Southern France)**

Serge Chiron, Claudio Minero, and Davide Vione

Field and laboratory data are consistent with 2,4-dichloro-6-nitrophenol in the Rhône delta arising from the photonitration of 2,4-dichlorophenol in rice-field water.

## ENVIRONMENTAL PROCESSES

■ 3134

**Chemical Speciation and Association of Plutonium with Bacteria, Kaolinite Clay, and Their Mixture**

Toshihiko Ohnuki, Takahiro Yoshida, Takuo Ozaki, Naofumi Kozai, Fuminori Sakamoto, Takuya Nankawa, Yoshinori Suzuki, and Arokiasamy J. Francis

Plutonium is preferentially sorbed to bacterial cells in a mixture consisting of bacteria and clay, with the reduction of Pu(VI) to Pu(V) and Pu(IV) only in the presence of bacteria.

■ Supporting information is available free at <http://pubs.acs.org/est>.  
► This issue contains a news story about this research.

■ 3140

**Characterizing Dissolved Cu and Cd Uptake in Terms of the Biotic Ligand and Biodynamics Using Enriched Stable Isotopes**

Marie-Noëlle Croteau and Samuel N. Luoma

Stable isotope tracers are used to characterize dissolved Cd and Cu influx rates in a freshwater gastropod in terms of the biotic ligand and biodynamics.

■ 3146

**Interactions between Elevated CO<sub>2</sub> and Warming Could Amplify DOC Exports from Peatland Catchments**

Nathalie Fenner, Christopher Freeman, Maurice A. Lock, Harry Harmens, Brian Reynolds, and Tim Sparks

Interactions between elevated CO<sub>2</sub> and warming could amplify DOC exports from peatlands because of a stimulation of plant inputs coupled with impaired microbial decomposition.

3153

**Spectroscopic Investigation of Ciprofloxacin Speciation at the Goethite–Water Interface**

Paras Trivedi and Dharni Vasudevan

Ciprofloxacin forms bidentate chelates at the goethite–water interface.

■ 3159

**Reactivity of Ferric Oxides toward H<sub>2</sub>S at Low pH**

Stefan Peiffer and Winfried Gade

Steady-state experiments with electrochemically generated H<sub>2</sub>S demonstrate that reductive dissolution rates depend on bulk mineral properties.

■ 3165

**Phenanthrene Sorption to Soil Humic Acid and Different Humic Fractions**

Bei Wen, Jing-jing Zhang, Shu-zhen Zhang, Xiao-quan Shan, Shahamat U. Khan, and Baoshan Xing

Humic is fractionated by a MIBK method, and the heterogeneity of each fraction is demonstrated by elemental analysis, UV, FTIR, <sup>13</sup>C-NMR, and phenanthrene sorption behavior.

3172

**Environmental Factors Influencing Sorption of Heterocyclic Aromatic Compounds to Soil**

Erping Bi, Torsten C. Schmidt, and Stefan B. Haderlein

Sorption of *N*-heterocyclic compounds depends strongly on temperature, ionic strength, and ion composition, whereas *O*- and *S*-heterocycles are rather insensitive to these parameters.

■ 3179

**In Situ Measurements of Metal Complex Exchange Kinetics in Freshwater**

Kent W. Warnken, William Davison, Hao Zhang, Josep Galceran, and Jaume Puy

Kinetic signatures for dissociation of a suite of trace metal complexes in freshwaters are obtained from in situ DGT measurements.

3186

**Incorporation of Eu(III) into Hydroxalcalite: A TRLFS and EXAFS Study**

T. Stumpf, H. Curtius, C. Walther, K. Dardenne, K. Ufer, and T. Fanghänel  
TRLFS and EXAFS measurements of an Eu(III)-doped hydroxalcalite show that the major part of the lanthanide is incorporated into the hydroxalcalite structure by replacing Al(III).

■ 3192

**Nonlinear Sorption of Three Alcohol Ethoxylates to Marine Sediment: a Combined Langmuir and Linear Sorption Process?**

Steven T. J. Droge and Joop L. M. Hermens

The nonlinear sorption isotherms for pure alcohol ethoxylates to marine sediment are determined with a dual-mode sorption model.