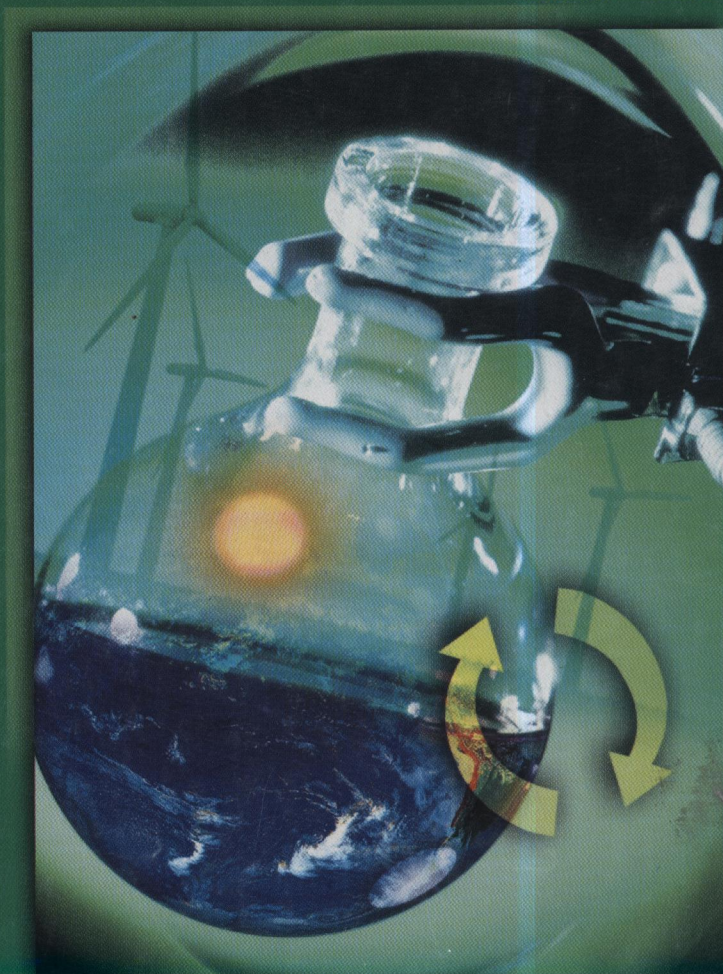


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# ENVIRONMENTAL Science & Technology

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## News and Features

### NEWS

#### 4834 Outsourcing U.S. greenhouse-gas emissions

The U.S. exports greenhouse-gas emissions to China and its other trading partners.

#### 4835 ESA: politics endangers science

A congressional hearing investigates whether political goals have pushed science out of the Endangered Species Act.

#### 4835-4839 News Briefs

Save a tree, cool the planet • Carbon emissions go up and up • Rating green biofuels • Biofuel pros and cons • Chromium in drinking water is carcinogenic • Making it easier to pollute

#### 4836 Finding PBDEs in couches and TVs

Researchers are using X-ray fluorescence to pinpoint household goods that are responsible for PBDE flame retardants in indoor air and dust.

#### 4837 Flying high with PBDEs

Airplane pilots, flight attendants, cleaning crews, and frequent fliers may take up substantial doses of brominated flame retardants.

#### 4838 Alberta's oil sands threaten water supplies

Canada's Athabasca River is in danger of drying up.

#### 4839 A new National Academies member

ES&T editorial advisory board member M. Granger Morgan puts science in a social context.

### VIEWPOINTS

#### 4840 Chemistry for a Sustainable Future

Vicki H. Grassian, Gerald Meyer, and other participants of the National Science Foundation Workshop on Sustainability and Chemistry held May 30-June 1, 2006, in Arlington, Va.



During a recent workshop, a diverse group of senior chemistry investigators with a wide range of expertise discussed four areas in which basic chemistry research and educational initiatives

#### 4847 Adding Sustainability to the Engineer's Toolbox: A Challenge for Engineering Educators

Cliff I. Davidson, H. Scott Matthews, Chris T. Hendrickson, Michael W. Bridges, Braden R. Allenby, John C. Crittenden, Yongsheng Chen, Eric Williams, David T. Allen, Cynthia F. Murphy, and Sharon Austin

The next generation of engineers must be able to design with a narrowing and diminishing set of natural resources for a wider variety and greater number of end users. Two workshops held in July 2006, conducted by the newly established Center for Sustainable Engineering at Carnegie Mellon University, explored critical questions in training engineers for the future. Davidson et al. summarize the key challenges identified in the workshops. They suggest focusing on these challenges as a guide for engineering programs that are considering revamping their curricula to incorporate principles of sustainability.

## Research

### CRITICAL REVIEW

#### 4851

#### Modeling the Past Atmospheric Deposition of Mercury Using Natural Archives

Harald Biester, Richard Bindler, Antonio Martinez-Cortizas, and Daniel R. Engstrom

A critical review is given of the use of lake sediments and peat bogs to reconstruct historical atmospheric mercury deposition by calculating mercury accumulation rates.

### POLICY ANALYSIS

#### 4861

#### Can Mold Contamination of Homes Be Regulated? Lessons Learned from Radon and Lead Policies

Felicia Wu, Tom Biksey, and Meryl H. Karol

We analyze how to develop policies to control mold and moisture in U.S. homes, on the basis of lessons learned from radon and lead policies.

#### 4868

#### Wastes as Co-Fuels: The Policy Framework for Solid Recovered Fuel (SRF) in Europe, with UK Implications

## CHARACTERIZATION OF NATURAL AND AFFECTED ENVIRONMENTS

■ 4882

### Assessment of Human Exposure to Polybrominated Diphenyl Ethers in China via Fish Consumption and Inhalation

Xiang-Zhou Meng, Eddy Y. Zeng, Li-Ping Yu, Ying Guo, and Bi-Xian Mai

Human exposure to PBDEs in China via inhalation and fish consumption is examined by gender and age group.

■ 4888

### Thermal Analytical Investigation of Biopolymers and Humic- and Carbonaceous-Based Soil and Sediment Organic Matter

Lu Zhang, Eugene J. LeBoeuf, and Baoshan Xing

Thermal analytical techniques provide thermodynamic properties of biopolymers and humic- and carbonaceous-based soil and sediment organic matter that represent a spectrum of differing diagenetic and/or thermal histories.

■ 4895

### Characterization of the Polarity of Natural Organic Matter under Ambient Conditions by the Polarity Rapid Assessment Method (PRAM)

Fernando L. Rosario-Ortiz, Shane Snyder, and I. H. (Mel) Suffet

A new method is introduced that allows the characterization of the polarity of aqueous NOM under ambient conditions in the environment.

■ 4901

### Evaluation of Noninvasive Approach for Monitoring PCB Pollution of Seabirds Using Preen Gland Oil

Rei Yamashita, Hideshige Takada, Michio Murakami, Masa-aki Fukuwaka, and Yutaka Watanuki

PCB concentrations in uropygial gland secretions from 30 seabirds (of 13 species, including albatross) are positively correlated with those in the adipose.

4907

### Influence of Breastfeeding in the Accumulation of Polybromodiphenyl Ethers during the First Years of Child Growth

Daniel Carrizo, Joan O. Grimalt, Nuria Ribas-Fito, Jordi Sunyer, and Maties Torrent

Breastfeeding determines the concentrations of PBDEs in sera of 4-year-old children from a cohort representing a general European population fed a typical Mediterranean diet.

4913

### Dietary Exposure of Juvenile Rainbow Trout (*Oncorhynchus mykiss*) to 1,2-Bis(2,4,6-tribromophenoxy)ethane:

4925

### Brominated Flame Retardants in Glaucous Gulls from the Norwegian Arctic: More Than Just an Issue of Polybrominated Diphenyl Ethers

Jonathan Verreault, Wouter A. Gebbink, Lewis T. Gauthier, Geir W. Gabrielsen, and Robert J. Letcher

Several unregulated, current-use brominated flame retardants and deca-BDE degradation products are detected in plasma and eggs of an avian top-predator species from the Norwegian Arctic.

■ 4932

### Changes in Surface Area and Concentrations of Semivolatile Organic Contaminants in Aging Snow

Debbie A. Burniston, William J. M. Strachan, John T. Hoff, and Frank Wania

The loss of organochlorine pesticides and PCBs from snow-packs aging under cold midwinter conditions is related to the loss of specific snow surface area.

## ENVIRONMENTAL PROCESSES

4938

### Platinum and Palladium Emissions from On-Road Vehicles in the Kaisermühlen Tunnel (Vienna, Austria)

Andreas Limbeck, Christoph Puls, and Markus Handler

Emission rates are presented that are calculated from the concentration differences between inside- and outside-tunnel aerosol samples along with data on traffic and air conditions.

4946

### Laboratory Investigation of the Potential for Re-emission of Atmospherically Derived Hg from Soils

Mei Xin, Mae Gustin, and Dale Johnson

Atmospheric Hg deposited to soils may be re-emitted over time, depending on Hg speciation, soil chemistry, and external factors.

4952

### Experimental Evidence of a Linear Relationship between Inorganic Mercury Loading and Methylmercury Accumulation by Aquatic Biota

Diane M. Orihel, Michael J. Paterson, Paul J. Blanchfield, R. A. (Drew) Bodaly, and Holger Hintelmann

The first experimental determination is provided of the relationship between inorganic mercury loading and methylmercury bioaccumulation in fish and their associated food web.

■ 4959

### Adsorptive Fractionation of Humic Acid at Air-Water Interfaces

Jun Ma, Jin Jiang, SuYan Pang, and Jin Guo

A commercial soil humic acid adsorbed at air-water interfaces under equilibrium conditions is fractionated in terms of mo-

A comparison is made of the exhaust emissions from six diesel school buses for continuous-idle, restart, and post-restart-idle operation.

4980

### **Quantifying the Degradation and Dilution Contribution to Natural Attenuation of Contaminants by Means of an Open System Rayleigh Equation**

Boris M. Van Breukelen

A modified Rayleigh equation applied to stable-isotope data determines the contribution of degradation and dilution to natural attenuation, as shown for a groundwater benzene plume.

■ 4986

### **Particle-Phase Dry Deposition and Air-Soil Gas-Exchange of Polybrominated Diphenyl Ethers (PBDEs) in Izmir, Turkey**

Banu Cetin and Mustafa Odabasi

This work investigates the particle-phase dry deposition and soil-air gas-exchange of PBDEs at different sites (suburban, urban, and industrial).

## **ENVIRONMENTAL MODELING**

■ 4993

### **Time-Variable Simulation of Soil Vapor Intrusion into a Building with a Combined Crawl Space and Basement**

William B. Mills, Sally Liu, Mark C. Rigby, and David Brenner

A time-variable analytical model that simulates soil vapor intrusion into dwellings with a crawl space and basement is developed and validated.

■ 5002

### **Multicomponent Diffusion Modeling in Clay Systems with Application to the Diffusion of Tritium, Iodide, and Sodium in Opalinus Clay**

C. Anthony J. Appelo and Paul Wersin

Diffusion of solutes is modeled with the zero-charge flux condition in free pore water and the diffuse double layer.

■ 5008

### **Combining Model Results and Monitoring Data for Water Quality Assessment**

Song S. Qian and Kenneth H. Reckhow

A Bayesian sequential approach is presented to update the procedure for combining model results and monitoring data for the assessment of compliance with water quality standards, providing a technical basis for adaptive management of a TMDL.

5014

### **Use of Field Data to Support European Water Framework Directive Quality Standards for Dissolved Metals**

Mark Crane, Kevin W. H. Kwok, Claire Wells, Paul Whitehouse, and Gilbert C. S. Lui

5028

### **Immunochemical Dipstick Assay Format Using Gold Nanoparticles Labeled Protein-Hapten Conjugate for the Detection of Atrazine**

Jasdeep Kaur, K. Vikas Singh, Robin Boro, K. R. Thampi, Manoj Raje, Grish C. Varshney, and C. Raman Suri

A lateral-flow-based dipstick immunoassay format is presented that uses a novel gold-protein-hapten conjugate for sensitive and rapid screening for atrazine in water samples.

## **REMEDIATION AND CONTROL TECHNOLOGIES**

■ 5037

### **Unregulated Emissions from a Heavy-Duty Diesel Engine with Various Fuels and Emission Control Systems**

Shida Tang, Brian P. Frank, Thomas Lanni, Greg Rideout, Norman Meyer, and Chris Beregszaszy

The effects of fuel type and emission-control technologies on emissions of BTEX, 1,3-butadiene, EC/OC, carbonyls, and PAHs from a diesel engine are evaluated.

■ 5044

### **Estimation of Water Sampling Rates and Concentrations of PAHs in a Municipal Sewage Treatment Plant Using SPMDs with Performance Reference Compounds**

Lijana Augulyte and Per-Anders Bergqvist

The effects of exposure conditions are modeled with in situ calibration to describe the SPMD-water exchange-rate kinetics.

■ 5050

### **Enhanced Visible-Light-Induced Photocatalytic Disinfection of *E. coli* by Carbon-Sensitized Nitrogen-Doped Titanium Oxide**

Qi Li, Rongcai Xie, Yin Wai Li, Eric A. Mintz, and Jian Ku Shang

Nitrogen-doped titanium oxide photocatalysts are synthesized by a sol-gel process and tested on *E. coli* for their antimicrobial properties.

■ 5057

### **Improved Adsorption of 4-Nitrophenol onto a Novel Hyper-Cross-Linked Polymer**

Bingcai Pan, Wei Du, Weiming Zhang, Xiao Zhang, Qingrui Zhang, Bingjun Pan, Lu Lv, Quanxing Zhang, and Jinglong Chen

A novel hyper-cross-linked polymeric adsorbent that has a uniquely bimodal pore size distribution is evaluated for 4-nitrophenol adsorption from water and is found to be amenable to regeneration for repeated use.

5063

### **Steady-State and Dynamic Desorption of Organic Vapor from Activated Carbon with Electrothermal Swing Adsorption**

Particle size distribution and emission rates of PM and elemental and organic carbon are shown to vary with four different diesel exhaust aftertreatment devices.

■ 5077

**Occurrence of Pharmaceuticals in River Water and Their Elimination in a Pilot-Scale Drinking Water Treatment Plant**

Niina M. Vieno, Heli Härkki, Tuula Tuhkanen, and Leif Kronberg

Pharmaceuticals present in river water can be efficiently eliminated in a pilot-scale treatment plant after ozonation and GAC filtration.

5085

**Questioning the Excessive Use of Advanced Treatment to Remove Organic Micropollutants from Wastewater**

Oliver A. H. Jones, Pat G. Green, Nikolaos Voulvoulis, and John N. Lester

The use of advanced treatment methods to clean sewage is likely to reduce pollution but may result in large financial and environmental costs.

■ 5090

**Factors Affecting Ionic Liquids Based Removal of Anionic Dyes from Water**

Yuan Chao Pei, Jian Ji Wang, Xiao Peng Xuan, Jing Fan, and Maohong Fan

Use of ionic liquids for removal of anionic dyes in water is discussed.

5096

**Inactivation of *Mycobacterium avium* with Free Chlorine**

Jeanne Luh and Benito J. Mariñas

Free chlorine inactivation of *M. avium*, mainly by hypochlorous acid, has stronger temperature dependence than that of any other pathogen of concern in drinking water.

5103

**Anchored Oxygen-Donor Coordination to Iron for Photodegradation of Organic Pollutants**

Hongwei Ji, Wenjing Song, Chuncheng Chen, Hong Yuan, Wanhong Ma, and Jincal Zhao

Fenton-like chemistry based on the O-donor coordinated iron complexes is explored because of the enormous application in the catalysis of degradation of organic pollutants in water.

■ 5108

**Response of Antibiotic Resistance Genes (ARG) to Biological Treatment in Dairy Lagoon Water**

Ruoting Pei, Jongmun Cha, Kenneth H. Carlson, and Amy Pruden

The effect of aerobic and anaerobic treatment at 20 °C and 4 °C on tetracycline, sulfonamide, and macrolide ARGs is explored in dairy-lagoon water.

■ 5114

**Removal of Heavy Metals from Aqueous Systems with Thiol Functionalized Superparamagnetic Nanoparticles**

The complete life cycle of anthropogenic iron is characterized for 68 countries and territories, nine world regions, and the whole planet.

■ 5130

**Development of a Framework for Quantifying the Environmental Impacts of Urban Development and Construction Practices**

Ke Li, Peng Zhang, John C. Crittenden, Subhrajit Guhathakurta, Yongsheng Chen, Harindra Fernando, Anil Sawhney, Peter McCartney, Nancy Grimm, Ramzy Kahhat, Himanshu Joshi, Goran Konjevod, Yu-Jin Choi, Ernesto Fonseca, Braden Allenby, Daniel Gerrity, and Paul M. Torres

A framework is developed to quantify the complex interrelationships among land use, construction practice, material consumption, and air quality.

5137

**Synthesis of Plant-Mediated Gold Nanoparticles and Catalytic Role of Biomatrix-Embedded Nanomaterials**

Nilesh C. Sharma, Shivendra V. Sahi, Sudip Nath, Jason G. Parsons, Jorge L. Gardea-Torresdey, and Tarasankar Pal

Synthesis of gold nanoparticles in *Sesbania drummondii* seedlings and reduction of aqueous 4-nitrophenol by nanomaterial-rich plant biomass are discussed.

## ECOTOXICOLOGY AND HUMAN ENVIRONMENTAL HEALTH

■ 5143

**Cell Death, Stress-Responsive Transgene Activation, and Deficits in the Olfactory System of Larval Zebrafish Following Cadmium Exposure**

Carlyn J. Matz and Patrick H. Krone

Cadmium induces activation of the heat-shock reporter gene, cell death, degeneration of olfactory sensory epithelium, and behavior deficits in larval zebrafish.

5149

**Stiffness Alterations of Single Cells Induced by UV in the Presence of NanoTiO<sub>2</sub>**

Bertrand Vileno, Małgorzata Lekka, Andrzej Sienkiewicz, Sylvia Jeney, Gabriela Stoessel, Janusz Lekki, László Forró, and Zbigniew Stachura

Atomic force microscopy detects early changes in stiffness of living cells exposed to oxidative stress induced by UV light in the presence of nanoTiO<sub>2</sub>.

5154

**Physiological Response to Persistent Organic Pollutants in Fish from Mountain Lakes: Analysis of CYP1A Gene Expression in Natural Populations of *Salmo trutta***

Laia Quirós, Sergio Jarque, Reinhard Lackner, Pilar Fernández, Joan O. Grimalt, and Benjamin Piña

Elevated CYP1A expression is evaluated as a physiological response to the presence of POPs in fish from European moun-