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ENVIRONMENTAL Science & Technology

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Known *and* Unexplored **ORGANIC CONSTITUENTS** *in the Earth's Atmosphere*

**Arsenic-Treated Wood in
Hurricane Katrina Debris**

Human Exposure to PBDEs

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News and Features

1502 Letter

Optimist by a landslide

1503 Comment

The IPCC Fourth Assessment

NEWS

1504 Arsenic in Katrina's wood debris

Treated lumber from houses and other structures destroyed by the hurricane poses a hazardous-waste disposal problem.

1505 The risk of PBDEs in dust

New research confirms that people can take up brominated flame retardants from the dust in their homes.

1505-1511 News Briefs

Plastic harms mouse eggs • Warmest year yet for U.S. • EPA allows pesticides to be applied to water • State of the world: more and more urban • Arsenic removal strategies debated • San Francisco sued over "toxic toy" ban • Taking aim at aviation emissions

1506 Dioxins and PCBs in rural areas

New measurements of dioxins and PCBs in ambient air over rural and remote regions of the U.S. show background levels and possible trends.

1507 Antimony levels in bottled water

Some plastic bottles leach more of the trace element than others.

1508 Climate change could offset ozone cleanup

Global warming leads to higher smog levels, according to new research.

1509 Debate over lead in air

Are lead levels in the air so low that the contaminant should no longer be a criteria pollutant?

1510 Unreliable water-quality forecasts at mines

More than three-quarters of U.S. hard-rock mines violate water-quality standards, despite company predictions.

1511 CO₂ in the Supreme Court

Optimists predict that the U.S. Congress will approve a global-warming bill in 2010.

1513 Technology Solutions

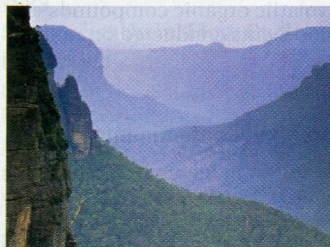
Lubes from vegetable oils become affordable

Cover: The photo of blue haze over the Blue Mountains in Australia was taken by Chris Ellis of GraphicScapes Photography.

FEATURE

1514 Known and Unexplored Organic Constituents in the Earth's Atmosphere

Allen H. Goldstein and Ian E. Galbally



A substantial fraction of both gas-phase and aerosol organic compounds have not been, or have very rarely been, directly measured in the atmosphere. Goldstein and Galbally review current knowledge about atmospheric organic constituents by asking the fol-

lowing questions: What atmospheric organic compounds do we know about and understand? What organic compounds could be present as gases and in aerosols? What evidence exists for additional organic compounds in the atmosphere? How well do we understand the transformations and fate of atmospheric organics? They conclude by suggesting opportunities for future research directions.

Research

POLICY ANALYSIS

■ 1523

Economic Input-Output Life-Cycle Assessment of Trade Between Canada and the United States

Jonathan Norman, Alex D. Charpentier, and Heather L. MacLean

Accounting for trade can significantly alter the results of life-cycle assessment studies; the production/consumption of goods in one country often exerts important cross-border environmental influences.

CHARACTERIZATION OF NATURAL AND AFFECTED ENVIRONMENTS

■ 1533

Quantities of Arsenic-Treated Wood in Demolition Debris Generated by Hurricane Katrina

Brajesh Dubey, Helena M. Solo-Gabriele, and Timothy G. Townsend

Arsenic quantities in Hurricane Katrina demolition debris are determined by field sampling.

■ 1537

A General Indication of the Contemporary Background Levels of PCDDs, PCDFs, and Coplanar PCBs in the Ambient Air over Rural and Remote Areas of the United States

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

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

David Cleverly, Joseph Ferrario, Christian Byrne, Karen Riggs, Darrell Joseph, and Pamela Hartford

The National Dioxin Air Monitoring Network establishes atmospheric background levels of PCDDs, PCDFs, and coplanar PCBs in rural and remote areas of the U.S.

1545

Sesquiterpene Emissions from Pine Trees—Identifications, Emission Rates and Flux Estimates for the Contiguous United States

Detlev Helmig, John Ortega, Tiffany Duhl, David Tanner, Alex Guenther, Peter Harley, Christine Wiedinmyer, Jana Milford, and Tanarit Sakulyanontvittaya

The contribution of sesquiterpene emissions from pine trees to the regional flux of biogenic volatile organic compounds is estimated from enclosure experiments conducted on nine pine species in the U.S.

■ 1554

Spatial Distribution of Perfluoroalkyl Contaminants in Lake Trout from the Great Lakes

Vasile I. Furdui, Naomi L. Stock, David A. Ellis, Craig M. Butt, D. Michael Whittle, Patrick W. Crozier, Eric J. Reiner, Derek C. G. Muir, and Scott A. Mabury

A systematic evaluation of spatial variability for perfluoroalkyl contaminants in lake trout from the Great Lakes is presented; field BAF values are reported for PFHxS, PFOS, PFOSA, PFOA, PFNA, and PFDA.

1560

▶ Contamination of Bottled Waters with Antimony Leaching from Polyethylene Terephthalate (PET) Increases upon Storage

William Shoty and Michael Krachler

Bottled waters become increasingly contaminated with Sb upon storage in PET(E) containers.

■ 1564

Biogeochemistry of Organic and Inorganic Arsenic Species in a Forested Catchment in Germany

Jen-How Huang and Egbert Matzner

The forest floor is presently a source where the mineral soil is a sink for arsenic in forest ecosystems.

■ 1570

Effects of Channel Restoration on Water Velocity, Transient Storage, and Nutrient Uptake in a Channelized Stream

Paul A. Bukaveckas

Stream restoration is shown to reduce downstream transport of nutrients when channel design mimics the geomorphology of natural channels.

■ 1577

Diagnostic Model Evaluation for Carbonaceous PM_{2.5} Using Organic Markers Measured in the Southeastern U.S.

Prakash V. Bhave, George A. Pouliot, and Mei Zheng

A combination of state-of-the-art measurements and models is used to answer key questions about the source of particulate carbon.

■ 1584

▶ Human Exposure to PBDEs: Associations of PBDE Body Burdens with Food Consumption and House Dust Concentrations

Nerissa Wu, Thomas Herrmann, Olaf Paepke, Joel Tickner, Robert Hale, Ellen Harvey, Mark La Guardia, Michael D. McClean, and Thomas F. Webster

PBDE concentrations in breast milk are associated with PBDE concentrations in house dust and reported consumption of meat and dairy products.

1590

Synthesis and Characterization of 2,3-Dibromopropyl-2,4,6-tribromophenyl Ether (DPTE) and Structurally Related Compounds Evidenced in Seal Blubber and Brain

Roland von der Recke and Walter Vetter

DPTE, the main component of the brominated flame retardant Bromkal 73 5 PE, is synthesized by the electrophilic addition of bromine to allyl-2,4,6-tribromophenyl ether, and its chirality is demonstrated.

ENVIRONMENTAL PROCESSES

1596

Ion-Specific Isotopic Fractionation of Molybdenum during Diffusion in Aqueous Solutions

Dmitry Malinovsky, Douglas C. Baxter, and Ilia Rodushkin

When Mo ions diffuse across a boundary into pure aqueous phase, their isotopic compositions change in concert with the developing concentration gradient and specific chemical forms of the element.

1601

Production of Hydrated Electrons from Photoionization of Dissolved Organic Matter in Natural Waters

Wei Wang, Oliver C. Zafiriou, Iu-Yam Chan, Richard G. Zepp, and Neil V. Blough

A new low-excitation-intensity laser flash photolysis apparatus is used, and apparent quantum yields of hydrated electrons from the photochemical reaction of colored DOM are reported in freshwater and soil.

■ 1608

Processes at the Sediment Water Interface after Addition of Organic Matter and Lime to an Acid Mine Pit Lake Mesocosm

Matthias Koschorreck, Elke Bozau, René Frömmichen, Walter Geller, Peter Herzsprung, and Katrin Wendt-Potthoff

Biological alkalinity generation in the sediment of acidic mining lakes is limited by the instability of the primary reaction products of microbial sulfate and iron reduction.

■ 1615

Degradation of Disinfection Byproducts by Carbonate Green Rust

Chan Lan Chun, Raymond M. Hozalski, and William A. Arnold

The kinetics and pathways of the reduction of selected chlorinated and brominated disinfection byproducts by carbonate green rust in either MOPS or carbonate buffer solutions are presented.

■ 1622

Fluid and Porous Media Property Effects on Dense Nonaqueous Phase Liquid Migration and Contaminant Mass Flux

C. T. Totten, M. D. Annable, J. W. Jawitz, and J. J. Delfino

The effects of fluid and porous media properties on nonaqueous phase liquid migration and associated contaminant mass-flux generation are evaluated with laboratory aquifer models.

■ 1628

Hydroxydicarboxylic Acids: Markers for Secondary Organic Aerosol from the Photooxidation of α -Pinene

Magda Claeys, Rafal Szmigielski, Ivan Kourtev, Pieter Van der Veken, Reinhilde Vermeylen, Willy Maenhaut, Mohammed Jaoui, Tadeusz E. Kleindienst, Michael Lewandowski, John H. Offenberg, and Edward O. Edney

Hydroxydicarboxylic acids, i.e., 3-hydroxyglutaric acid and 2-hydroxy-4-isopropyladipic acid, are identified as major photooxidation products of α -pinene in laboratory and ambient

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secondary organic aerosol with gas chromatography/mass spectrometry.

■ 1635

Lack of Enantioselective Microbial Degradation of Chlordane in Long Island Sound Sediment

Xiqing Li, Lijia Yang, Urs Jans, Michael E. Melcer, and Pengfei Zhang

Racemic or nearly racemic chiral signatures of *cis*- and *trans*-chlordane in Long Island Sound sediment indicate the lack of enantioselective microbial degradation of chlordane.

1641

Geochemical Modulation of Bioavailability and Toxicity of Nitroaromatic Compounds to Aquatic Plants

Michael G. Roberts, Clayton L. Rugh, Hui Li, Brian J. Teppen, and Stephen A. Boyd

Ion-exchange reactions on smectites can be used to sequester and release 2,4-dinitrotoluene and provide a way to advantageously control bioavailability and environmental toxicity.

ENVIRONMENTAL MODELING

■ 1646

Electronic Polarizability as a Predictor of Biodegradation Rates of Dimethylnaphthalenes. An *Ab Initio* and Density Functional Theory Study

Vito Librando and Andrea Alparone

Accurate data of structure, relative energies, and polarizabilities of dimethylnaphthalene isomers are calculated, and relationships with the observed biodegradation rates are explored.

ENVIRONMENTAL MEASUREMENTS METHODS

■ 1653

Multivariate Chemical Mapping of Antibiotics and Identification of Structurally Representative Substances

Ester Papa, Jerker Fick, Richard Lindberg, Magnus Johansson, Paola Gramatica, and Patrik L. Andersson

A test of 20 antibiotics is selected using a multivariate approach in which data on environmental relevance are combined with structural representation.

1662

Volatile Organic Compounds in Human Milk: Methods and Measurements

Sung R. Kim, Rolf U. Halden, and Timothy J. Buckley

Breast milk from nonsmoking mothers contains detectable amounts of VOCs but for the infant presents a minor pathway of exposure relative to inhalation.

1668

A Method of Measuring *Escherichia Coli* O157:H7 at 1 Cell/mL in 1 Liter Sample Using Antibody Functionalized Piezoelectric-Excited Millimeter-Sized Cantilever Sensor

Gossett A. Campbell and Raj Mutharasana

Antibody-immobilized PEMC sensors detect *E. coli* O157:H7 at 1 cell/mL in 1-L samples in batch and flow modes.

REMEDATION AND CONTROL TECHNOLOGIES

■ 1675

Causes of Variable Biomass Density and Its Effects on Settability in Full-Scale Biological Wastewater Treatment Systems

Andrew J. Schuler and Hoon Jang

Microbial biomass density is determined to be an important, and variable, factor affecting the settleability of biosolids produced in biological wastewater treatment.

■ 1682

UV Degradation Kinetics and Modeling of Pharmaceutical Compounds in Laboratory Grade and Surface Water via Direct and Indirect Photolysis at 254 nm

Vanessa J. Pereira, Howard S. Weinberg, Karl G. Linden, and Philip C. Singer

The use of low-pressure UV direct photolysis and H₂O₂-assisted oxidation for degradation of pharmaceutical compounds in drinking water is addressed.

1689

Study of an Axial Flow Cyclone to Remove Nanoparticles in Vacuum

Chuen-Jinn Tsai, Sheng-Chieh Chen, Rafal Przekop, and Arkadiusz Moskal

An axial flow cyclone for removing nanoparticles is developed and tested in reduced pressure, and experimental data are validated by Brownian Dynamic Simulation.

■ 1696

Trichloroethene Degradation by UV/H₂O₂ Advanced Oxidation Process: Product Study and Kinetic Modeling

Ke Li, Mihaela I. Stefan, and John C. Crittenden

A UV/H₂O₂ process effectively degrades trichloroethene through four pathways initiated by OH-radical, UV-photolysis, and chlorine-radical reactions; these are successfully modeled.

■ 1704

Decomposition of N₂O over Hexaaluminate Catalysts

Marta Santiago and Javier Pérez-Ramírez

The first application of metal-substituted hexaaluminates as active and durable catalysts for high-temperature direct N₂O decomposition is reported.

■ 1710

Effects of the Nonionic Surfactant Tween 80 on Microbial Reductive Dechlorination of Chlorinated Ethenes

Benjamin K. Amos, Rebecca C. Daprato, Joseph B. Hughes, Kurt D. Pennell, and Frank E. Löffler

The effects of Tween 80 on dechlorinating bacteria are investigated to evaluate the feasibility of coupling surfactant flushing with microbial reductive dechlorination for enhanced treatment of chlorinated ethene source zones.

1717

Formation and Durability of Dithiocarbamic Metals in Stabilized Air Pollution Control Residue from Municipal Solid Waste Incineration and Melting Processes

Hirofumi Sakanakura

Studies on the formation and stability of dithiocarbamic metals demonstrate changes in chemical properties of stabilized waste because of the effect of the surrounding landfill environment.

■ 1723

Photodegradation of Rhodamine B in Water Assisted by Titania Nanorod Thin Films Subjected to Various Thermal Treatments

Jin-Ming Wu

Well-crystallized titania nanorod thin films synthesized through in situ, low-temperature oxidation of metallic titani-

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

um substrates with hydrogen peroxide solutions possess very high efficiency to photodegrade rhodamine B in water.

■ 1729

Distribution and Abiotic Degradation of Chlorinated Solvents in Heated Field Samples

Jed Costanza and Kurt D. Pennell

Heating ampoules containing chlorinated-solvent-contaminated field samples to between 55 and 95 °C increases PCE desorption but has minimal effect on PCE degradation.

1735

Novel Mercury Control Technology for Solid Waste Incineration: Sodium Tetrasulfide (STS) as Mercury Capturing Agent

Yangsheng Liu, Shaodong Xie, Yaqiong Li, and Yushan Liu

A novel mercury-removing technology, injection of sodium tetrasulfide dissolved in the sodium hydroxide solution in the spray-dryer system, is beneficial for industrial-scale application at solid-waste incineration or coal-combustion facilities.

1740

Electrochemical Stimulation of Microbial Perchlorate Reduction

J. Cameron Thrash, J. Ian Van Trump, Karrie A. Weber, Elisabeth Miller, Laurie A. Achenbach, and John D. Coates

Perchlorate is microbially attenuated in a novel bioreactor by using a cathode as the electron source; this improves monitoring and control and negates issues traditionally associated with biological treatment.

1747

XAS and XPS Characterization of Mercury Binding on Brominated Activated Carbon

Nick D. Hutson, Brian C. Attwood, and Kirk G. Scheckel

X-ray absorption and X-ray photoelectron spectroscopies are used to determine information regarding the speciation and binding of mercury on brominated activated carbon sorbents.

1753

Rapid Response Concentration-Controlled Desorption of Activated Carbon to Dampen Concentration Fluctuations

Zaher Hashisho, Hamidreza Emamipour, Diego Cevallos, Mark J. Rood, K. James Hay, and Byung J. Kim

A revised microwave-swing adsorption system, operated to provide specific organic vapor concentrations at a separately controlled total gas flow rate, is described.

SUSTAINABILITY ENGINEERING AND GREEN CHEMISTRY

■ 1759

Dining at the Periodic Table: Metals Concentrations as They Relate to Recycling

Jeremiah Johnson, E. M. Harper, Reid Lifset, and T. E. Graedel

An updated correlation between refined metal price and ore grade, inspired by Sherwood analysis, suggests why some metals in discarded products are recycled and some are not.

ECOTOXICOLOGY AND HUMAN ENVIRONMENTAL HEALTH

■ 1766

Selenium Toxicity To Invertebrates: Will Proposed Thresholds for Toxicity To Fish and Birds Also Protect Their Prey?

Adrian M. H. deBruyn and Peter M. Chapman

A review of existing data suggests that selenium thresholds that have been proposed to protect fish and birds may not protect their invertebrate prey.

■ 1771

Effects of Chytrid and Carbaryl Exposure on Survival, Growth and Skin Peptide Defenses in Foothill Yellow-legged Frogs

Carlos Davidson, Michael F. Benard, H. Bradley Shaffer, John M. Parker, Chadrick O'Leary, J. Michael Conlon, and Louise A. Rollins-Smith

The effects of chytrid fungus (*Batrachochytrium dendrobatidis*) and carbaryl pesticide exposure on survival, growth, and antimicrobial skin peptide defenses in foothill yellow-legged frogs (*Rana boylei*) are discussed.

■ 1777

Predicting Copper Toxicity with Its Intracellular or Subcellular Concentration and the Thiol Synthesis in a Marine Diatom

Ai-Jun Miao and Wen-Xiong Wang

Copper toxicity to a marine diatom is better predicted with the intracellular Cu as compared with the free-iron-activity model and biotic-ligand model.

1783

Variation in the Bioaccumulation of a Sediment-Sorbed Hydrophobic Compound by Benthic Macroinvertebrates: Patterns and Mechanisms

Paul N. Gaskell, Amy C. Brooks, and Lorraine Maltby

We describe factors influencing dietary uptake of a sediment-bound superhydrophobic organic compound in four species of freshwater benthic macroinvertebrate.

■ 1790

Prokaryotic Gene Profiling Assays to Detect Sediment Toxicity: Evaluating the Ecotoxicological Relevance of a Cell-Based Assay

F. Dardenne, R. Smolders, W. De Coen, and R. Blust

Bacterial stress gene introduction profiles reflect responses at higher levels of biological organization in a Belgian freshwater river basin.

CORRESPONDENCE AND REBUTTAL

■ 1797

Comment on "Discrimination of Shifts in a Soil Microbial Community Associated with TNT-Contamination Using a Functional ANOVA of 16S rRNA Hybridized to Oligonucleotide Microarrays"

Alex E. Pozhitkov and Peter A. Noble

1799

Response to Comment on "Discrimination of Shifts in a Soil Microbial Community Associated with TNT-Contamination Using a Functional ANOVA of 16S rRNA Hybridized to Oligonucleotide Microarrays"

L. Eyers, J. C. Smoot, and D. A. Stahl

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