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ENVIRONMENTAL Science & Technology

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Parking Lot Sealcoat: *An Unrecognized* **SOURCE of URBAN PAHs**

Verifying Ballast-Water Treatment Performance

**Microarray Analysis of Toxicogenomic Effects of
Peracetic Acid on *P. aeruginosa***

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CHEMICAL SOCIETY

Characterization of Natural and Affected Environments

5505

Natural Occurrence of Hexavalent Chromium in the Aromas Red Sands Aquifer, California

A. R. Gonzalez, K. Ndung'u, and A. R. Flegel

Results from analysis of groundwater and sediment samples indicate that hexavalent chromium occurs naturally in the Aromas Red Sands aquifer, Santa Cruz County, Calif.

5512

Activities of Pu and Am Isotopes and Isotopic Ratios in a Soil Contaminated by Weapons-Grade Plutonium

M. H. Lee and S. B. Clark

Activities of ^{238}Pu , ^{239}Pu , ^{240}Pu , ^{241}Pu , and ^{241}Am from the site of a fire involving a nuclear warhead are reported and used to characterize the source material.

5517

Circumpolar Study of Perfluoroalkyl Contaminants in Polar Bears (*Ursus maritimus*)

Marla Smithwick, Scott A. Mabury, Keith R. Solomon, Christian Sonne, Jonathan W. Martin, Erik W. Born, Rune Dietz, Andrew E. Derocher, Robert J. Letcher, Thomas J. Evans, Geir W. Gabrielsen, John Nagy, Ian Stirling, Mitch K. Taylor, and Derek C. G. Muir

Spatial trends and the effects of age and gender on levels of perfluoroalkyl substances in polar bear liver tissue from the North American and European Arctic are examined.

■ 5524

Evaluation of Perfluorooctane Surfactants in a Wastewater Treatment System and in a Commercial Surface Protection Product

Bryan Boulanger, John D. Vargo, Jerald L. Schnoor, and Keri C. Hornbuckle

Concentrations of fluorinated surfactants are reported for a wastewater treatment plant and a commercial surface protection product; the biotransformation potential of perfluorooctane sulfonamide compounds is explored.

5531

Variation in Arsenic Speciation and Concentration in Paddy Rice Related to Dietary Exposure

P. N. Williams, A. H. Price, A. Raab, S. A. Hossain, J. Feldmann, and A. A. Meharg

North American rice is more contaminated than that from Southeast Asia, but the American grain contains more organic arsenic.

5541

NMR Spectroscopy Study of Freshwater Humic Material in Light of Supramolecular Assembly

Juhani Peuravuori

One-dimensional NMR experiments stimulated further work with more advanced multidimensional NMR techniques that are aimed at resolving the uncertainty about the supramolecular assembly of dissolved humic material.

5550

Atmospheric Concentrations and Deposition of Polycyclic Aromatic Hydrocarbons to the Mid-Atlantic East Coast Region

Cari L. Gigliotti, Lisa A. Totten, John H. Offenberg, Jordi Dachs, John R. Reinfelder, Eric D. Nelson, Thomas R. Glenn IV, and Steven J. Eisenreich

Notices to *ES&T* authors

1. Beginning immediately, *ES&T* will stringently enforce the 7000-word length limit for research manuscripts. Articles are expected to be clear, concise, and comprehensive (not a fragmented story). Manuscripts may exceed the 7000-word limit under highly unusual circumstances, but the length must be justified at submission. Lengthy papers risk being summarily declined. Tables and figures that augment the article but are otherwise unessential to the major themes must be placed in Supporting Information (which is freely accessible on the web). Authors should provide a word count in their cover letter. The count should include all text and references, and 300 words should be added for each figure and table. Large, multipart figures and extensive tables should be counted as 600 words.
2. We are pleased to inaugurate a new subject heading, Ecotoxicology and Human Environmental Health, in recognition of the emerging importance of this field and the increasing number of *ES&T* papers being submitted.
3. Submitted manuscripts must now include email addresses for all coauthors, in addition to full contact information for the corresponding author. Please also provide a list of at least four suggested reviewers and their contact information (email addresses are preferred).

Atmospheric deposition of PAHs to the Hudson River Estuary is estimated from measurements of atmospheric concentrations and deposition from the New Jersey Atmospheric Deposition Network.

■ 5560

► Parking Lot Sealcoat: An Unrecognized Source of Urban Polycyclic Aromatic Hydrocarbons

Barbara J. Mahler, Peter C. Van Metre, Thomas J. Bashara, Jennifer T. Wilson, and David A. Johns

Sealcoating, widely used on parking lots and driveways in North America, may dominate PAH loading to urban streams.

■ 5567

► Trends in Hydrophobic Organic Contaminants in Urban and Reference Lake Sediments across the United States, 1970–2001

Peter C. Van Metre and Barbara J. Mahler

Widespread decreases in chlorinated hydrocarbons and increases in PAHs are seen in lake sediments across the U.S.

■ 5575

► Tidal Forcing of Enterococci at Marine Recreational Beaches at Fortnightly and Semidiurnal Frequencies

Alexandria B. Boehm and Stephen B. Weisberg

Enterococci concentrations are higher and more likely to exceed water quality standards during spring and spring-ebb tides at geographically distinct marine beaches with diverse geomorphology.

5584

Polybrominated Diphenyl Ether Trends in Eggs of Marine and Freshwater Birds from British Columbia, Canada, 1979–2002

John E. Elliott, Laurie K. Wilson, and Bryan Wakeford

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

An analysis of archived samples reveals that concentrations of PBDE flame retardant chemicals are increasing at an exponential rate in eggs of fish-eating birds from British Columbia, Canada.

■ 5592

Prediction of Personal Exposure to PM_{2.5} and Carcinogenic Polycyclic Aromatic Hydrocarbons by Their Concentrations in Residential Microenvironments

Takeshi Ohura, Takahiro Noda, Takashi Amagai, and Masahiro Fusaya
Personal exposure to PM_{2.5} and carcinogenic PAHs is investigated; predictions of personal concentrations based on indoor microenvironments concentrations are evaluated.

■ 5600

Polybrominated Diphenyl Ethers in the Sediments of the Great Lakes. 3. Lakes Ontario and Erie

Wenlu Song, Justin C. Ford, An Li, Neil C. Sturchio, Karl J. Rockne, Dave R. Buckley, and William J. Mills

Samples from sediment cores are analyzed for 10 PBDE congeners and 39 PCBs, and concentration profiles are constructed against sediment depth for each sampling location.

■ 5606

Polychlorinated Dioxins, Furans, and Biphenyls, and Polybrominated Diphenyl Ethers in a U.S. Meat Market Basket and Estimates of Dietary Intake

Janice K. Huwe and Gerald L. Larsen

Polychlorinated dibenzo-*p*-dioxins and dibenzofurans, PCBs, and PBDEs are analyzed in U.S. meat samples, and dietary intakes are estimated for these products.

5612

Polybrominated Diphenyl Ethers and Hydroxylated and Methoxylated Brominated and Chlorinated Analogues in the Plasma of Fish from the Detroit River

Karlis Valters, Hongxia Li, Mehran Alaei, Ivy D'Sa, Göran Marsh, Åke Bergman, and Robert J. Letcher

PBDEs, hydroxylated PBDEs, triclosan, and methoxylated triclosan are identified and quantified in the plasma of benthic and pelagic fish species from the Detroit River.

Environmental Processes

5620

Evidence for Biogenic Pyromorphite Formation by the Nematode *Caenorhabditis elegans*

B. P. Jackson, P. L. Williams, A. Lanzirrotti, and P. M. Bertsch

Aqueous exposure of the nematode *C. elegans* to lead results in micrometer-scale, localized internal precipitation of the lead phosphate pyromorphite in the pharynx.

5626

Aerobic Biodegradation Behavior of Nonylphenol Polyethoxylates and Their Metabolites in the Presence of Organic Matter

Shinya Hayashi, Shigeo Saito, Ju-Hyun Kim, Osamu Nishimura, and Ryuichi Sudo

Organic matters play a significant role in controlling the biodegradation pathway of NPnEO.

5634

Carbon Isotope Fractionation in the Reductive Dehalogenation of Carbon Tetrachloride at Iron (Hydr)Oxide and Iron Sulfide Minerals

Luc Zwank, Martin Elsner, Anna Aeberhard, René P. Schwarzenbach, and Stefan B. Haderlein

Compound-specific carbon isotope analysis reveals insights into the mechanisms of CCl₄ dehalogenation at iron minerals

and opens new perspectives for characterizing reactive iron minerals in the subsurface.

■ 5642

Chemical Reduction of U(VI) by Fe(II) at the Solid-Water Interface Using Natural and Synthetic Fe(III) Oxides

Byong-Hun Jeon, Brian A. Dempsey, William D. Burgos, Mark O. Barnett, and Eric E. Roden

Sorption of U(VI) to materials that contain natural Fe(III) oxides interferes with abiological reduction of U(VI) by sorbed Fe(II) at the solid-water interface.

5650

Sulfur Speciation and Stable Isotope Trends of Water-Soluble Sulfates in Mine Tailings Profiles

Bernhard Dold and Jorge E. Spangenberg

Sulfur speciation and stable isotope trends of water-soluble sulfates in porphyry copper mine tailings profiles from different climates in Chile are given.

5657

Bioreduction of Uranium: Environmental Implications of a Pentavalent Intermediate

Joanna C. Renshaw, Laura J. C. Butchins, Francis R. Livens, Iain May, John M. Charnock, and Jonathan R. Lloyd

The mechanism of U(VI) reduction by *Geobacter sulfurreducens*, via an unstable U(V) intermediate, is investigated by XAS and supported by studies using stable Np(V).

■ 5661

Identification and Quantification of Aerosol Polar Oxygenated Compounds Bearing Carboxylic or Hydroxyl Groups. 2. Organic Tracer Compounds from Monoterpenes

M. Jaoui, T. E. Kleindienst, M. Lewandowski, J. H. Offenberg, and E. O. Edney

Polar organic compounds found in the field are compared with those produced in secondary organic aerosol from laboratory irradiations of natural hydrocarbons and NO_x.

5674

Measurements of Secondary Organic Aerosol from Oxidation of Cycloalkenes, Terpenes, and *m*-Xylene Using an Aerodyne Aerosol Mass Spectrometer

R. Bahreini, M. D. Keywood, N. L. Ng, V. Varutbangkul, S. Gao, R. C. Flagan, J. H. Seinfeld, D. R. Worsnop, and J. L. Jimenez

Fragmentation patterns observed for biogenic versus anthropogenic SOA may be useful in determining the sources of ambient SOA.

5689

Gaseous Mercury from Curing Concretes that Contain Fly Ash: Laboratory Measurements

Danold W. Golightly, Ping Sun, Chin-Min Cheng, Panuwat Taerakul, Harold W. Walker, Linda K. Weavers, and Dean M. Golden

Total gaseous mercury in headspace air is measured for enclosed concretes during dry curing; it is shown that nearly all mercury is retained in the concrete.

■ 5694

Development of a Biotic Ligand Model and a Regression Model Predicting Acute Copper Toxicity to the Earthworm *Aporrectodea caliginosa*

Nathanaël T. M. Steenbergen, Federica Iaccino, Maaïke de Winkel, Lucas Reijnders, and Willie J. G. M. Peijnenburg

A new type of toxicity model for predicting copper toxicity to earthworms, based on cation competition for the biotic ligand, is presented.

5703

Total Mercury, Methyl Mercury, and Selenium Levels in the Red Meat of Small Cetaceans Sold for Human Consumption in Japan

Tetsuya Endo, Koichi Haraguchi, Yohei Hotta, Yohsuke Hisamichi, Shane Lavery, Merel L. Dalebout, and C. Scott Baker

Levels of total mercury, methyl mercury, and selenium in odontocete red meats caught off Japan are listed.

■ 5709

Bacterial Siderophores Promote Dissolution of UO_2 under Reducing Conditions

Scott W. Frazier, Ruben Kretzschmar, and Stephan M. Kraemer

The bacterial siderophore desferrioxamine-B accelerates uraninite dissolution by a ligand-controlled mechanism and increases uraninite solubility under reducing conditions.

5716

Comparison of Biota-Sediment Accumulation Factors across Ecosystems

Lawrence P. Burkhard, Philip M. Cook, and Marta T. Lukasewycz

Sets of BSAFs for nonpolar organic chemicals have a consistent scaling/ranking of individual BSAFs across ecosystems for fish species.

5722

Laboratory Investigation of Heterogeneous Interaction of Sulfuric Acid with Soot

Dan Zhang and Renyi Zhang

Uptake of H_2SO_4 takes place efficiently on soot particles; this represents an important route to convert hydrophobic soot to hydrophilic aerosols.

5729

Stimulation of Pyrene Mineralization in Freshwater Sediments by Bacterial and Plant Bioaugmentation

Yves Jouanneau, John C. Willison, Christine Meyer, Serge Krivobok, Nathalie Chevron, Jean-Luc Besombes, and Gérard Blake

Plants or PAH-degrading bacteria enhance pollutant removal, but their effects are not necessarily cumulative.

Environmental Modeling

■ 5736

Simultaneous Application of Dissolution/Precipitation and Surface Complexation/Surface Precipitation Modeling to Contaminant Leaching

Defne S. Apul, Kevin H. Gardner, T. Taylor Eighmy, Ann-Marie Fällman, Olaus Magnus, and Rob N. J. Comans

Theoretical models for solubility, competitive sorption, and surface precipitation phenomena are simultaneously applied to ion leaching from a complicated, weathered, steel slag matrix.

5742

Intercomparison of the Community Multiscale Air Quality Model and CALGRID Using Process Analysis

Susan M. O'Neill and Brian K. Lamb

The domain, observational network used to verify model results and system inputs, meteorology, emission inventory, and initial and boundary conditions are described; model results are discussed.

Environmental Measurements Methods

5754

Trace Metals in Ambient Air: Hourly Size-Segregated Mass Concentrations Determined by Synchrotron-XRF

Nicolas Bukowiecki, Matthias Hill, Robert Gehrig, Christoph N. Zwicky, Peter Lienemann, Ferenc Hegedűs, Gerald Falkenberg, Ernest Weingartner, and Urs Baltensperger

The elemental analysis of hourly resolved, size-segregated ambient aerosol samples by synchrotron radiation X-ray fluorescence spectrometry is presented.

5763

Using Passive Air Samplers To Assess Urban-Rural Trends for Persistent Organic Pollutants and Polycyclic Aromatic Hydrocarbons. 2. Seasonal Trends for PAHs, PCBs, and Organochlorine Pesticides

Anne Motelay-Massei, Tom Harner, Mahiba Shoeib, Miriam Diamond, Gary Stern, and Bruno Rosenberg

Seasonal variations of derived air concentrations for PCBs, PAHs, and organochlorine pesticides reflect the different source characteristics for these compounds.

Remediation and Control Technologies

5774

Start-Up, Microbial Community Analysis and Formation of Aerobic Granules in a *tert*-Butyl Alcohol Degrading Sequencing Batch Reactor

Stephen Tiong-Lee Tay, Wei-Qin Zhuang, and Joo-Hwa Tay

Aerobic granules for TBA biodegradation can be developed in a sequencing batch reactor exposed to increasing TBA concentrations in the influent.

5781

Efficacy of an Advanced Sewage Treatment Plant in Southeast Queensland, Australia, to Remove Estrogenic Chemicals

Frédéric D. L. Leusch, Heather F. Chapman, Wolfgang Körner, S. Ravi Gooneratne, and Louis A. Tremblay

The estrogenicity profile of sewage in a domestic sewage treatment plant in southeast Queensland shows that activated sludge treatment removes >95% of the estrogenic activity.

5787

Redox Processes and Release of Organic Matter after Thermal Treatment of a TCE-Contaminated Aquifer

A. K. Friis, H.-J. Albrechtsen, G. Heron, and P. L. Bjerg

Microcosm studies of thermal remediation show unchanged redox conditions, release of organic matter from sediments into groundwater, and a potential for bioaugmentation after heating.

5796

Characterization Study and Five-Cycle Tests in a Fixed-Bed Reactor of Titania-Supported Nickel Oxide as Oxygen Carriers for the Chemical-Looping Combustion of Methane

Beatriz M. Corbella, Luis F. de Diego, Francisco García-Labiano, Juan Adánez, and José M. Palacios

Titania-supported nickel oxide carriers are tested as oxygen carriers at 900 °C in reactors; methane is used for the reduction stage, and air is used for the regeneration stage.

5804

Inactivation of *Ascaris suum* and Poliovirus in Biosolids under Thermophilic Anaerobic Digestion Conditions

Michael D. Aitken, Mark D. Sobsey, Kimberly E. Blauth, Mina Shehee, Phillip L. Crunk, and Glenn W. Walters

Rates of *Ascaris suum* and poliovirus inactivation in biosolids are much more rapid than suggested by the U.S. EPA's time-temperature equations for achieving Class A biosolids.

■ Supporting information is available free at <http://pubs.acs.org/est>.

5810

Fenton Degradation of Organic Compounds Promoted by Dyes under Visible Irradiation

Jiahai Ma, Wenjing Song, Chuncheng Chen, Wanhong Ma, Jincai Zhao, and Yalin Tang

Dyes, such as Alizarin Violet 3B, that contain a quinone accelerate Fenton degradation and mineralization better than those without one; a reaction mechanism is proposed.

5816

Removal of Antibiotics in Wastewater: Effect of Hydraulic and Solid Retention Times on the Fate of Tetracycline in the Activated Sludge Process

Sungpyo Kim, Peter Eichhorn, James N. Jensen, A. Scott Weber, and Diana S. Aga

The removal of tetracyclines in wastewater by the activated sludge process increases with longer solid retention times; elimination is primarily due to sorption.

■ 5824

Micellar Catalyzed Degradation of Fenitrothion, an Organophosphorus Pesticide, in Solution and Soils

Vimal K. Balakrishnan, Erwin Buncel, and Gary W. vanLoon

Reactive counterion surfactants rapidly degrade the OP pesticide fenitrothion in aqueous solution and in contaminated soils; rate enhancement is especially significant when the counterions are α -nucleophiles.

■ 5831

Temperature-Dependent Formation of Polychlorinated Naphthalenes and Dibenzofurans from Chlorophenols

Do Hyong Kim and James A. Mulholland

Flow reactor results are presented for the gas-phase formation of chlorinated naphthalenes and dibenzofurans from three chlorophenols.

5837

Effect of Current Density on Enhanced Transformation of Naphthalene

Akram N. Alshawabkeh and Hussam Sarahney

Naphthalene transformation is assessed in electrochemical reactors at varying electric current densities and naphthalene concentrations; the effect of redox potential, pH, and Cl_2 is determined.

5844

Fundamental Adsorption Characteristics of Carbonaceous Adsorbents for 1,2,3,4-Tetrachlorobenzene in a Model Gas of an Incineration Plant

Kenichiro Inoue and Katsuya Kawamoto

When adsorption characteristics of activated carbons, activated coke, and carbide wood are examined, micropore volume for pore diameters of ≤ 2 nm emerges as the most important factor.

5851

Preliminary Investigation of the Supply of Chemical Species to an Aqueous Solution Using a Hydrogen–Oxygen Flame

Miho Uchida, Takahiro Sogabe, Tadaaki Ikoma, and Akitsugu Okuwaki

It is shown that hydroxyl radicals can be supplied to an aqueous solution when a hydrogen–oxygen flame is blown against the surface of a solution.

■ 5856

Biodegradation of α -Pinene in Model Biofilms in Biofilters

Martha J. Miller and D. Grant Allen

A new mechanism involving the initial rapid oxidation of α -pinene to a more soluble product is developed to explain the relatively rapid degradation of α -pinene within biofilms in biofilters.

5864

Equilibrium and Heat of Adsorption for Organic Vapors and Activated Carbons

David Ramirez, Shaoying Qi, Mark J. Rood, and K. James Hay

ΔH_s values for organic vapors and adsorbents are evaluated with an expression based on the Polanyi adsorption potential and the Clausius–Clapeyron equation.

5872

Oxidation of Benzoic Acid by Electrochemically Generated Ce(IV)

Martha E. Armenta-Armenta and Arthur F. Diaz

The oxidation of benzoic acid by electrogenerated cerium(IV) sulfate in dilute acid solutions is studied to determine the kinetics of the overall oxidation process.

■ 5878

Dynamic Change of Copper in Fly Ash during de Novo Synthesis of Dioxins

Masaki Takaoka, Atsuhiko Shiono, Kohei Nishimura, Takashi Yamamoto, Tomoya Uruga, Nobuo Takeda, Tsunehiro Tanaka, Kazuyuki Oshita, Tadao Matsumoto, and Hiroki Harada

Using in situ XANES experiments, strong evidence of dioxin formation is found by examining the dynamic change of copper during heating of fly ash.

Sustainability Engineering and Green Chemistry

5885

Life-Cycle Inventory of Waste Solvent Distillation: Statistical Analysis of Empirical Data

Christian Capello, Stefanie Hellweg, Beat Badertscher, and Konrad Hungerbühler

Generic inventory data of waste solvent distillation processes are determined on the basis of a statistical analysis of 150 industry processes.

Ecotoxicology and Human Environmental Health

■ 5893

Microarray Analysis of Toxicogenomic Effects of Peracetic Acid on *Pseudomonas aeruginosa*

Wook Chang, David A. Small, Freshteh Toghrol, and William E. Bentley

The microarray analysis of global gene expression changes of *P. aeruginosa* after a 20-min exposure to 1 mM peracetic acid is described.

Correspondence and Rebuttal

5900

Comment on "Perchlorate and Iodide in Dairy and Breast Milk"

Steven H. Lamm, Manning Feinleib, Arnold Engel, and John P. Gibbs

5902

Response to Comment on "Perchlorate and Iodide in Dairy and Breast Milk"

Andrea B. Kirk, P. Kalyani Martinelango, Kang Tian, Aniruddha Dutta, Ernest E. Smith, and Purnendu K. Dasgupta

Additions and Corrections

5904

Brominated Flame Retardants in Sediment Cores from Lakes Michigan and Erie

Lingyan Zhu and Ronald A. Hites

■ Supporting information is available free at <http://pubs.acs.org/est>.