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Environmental Science & Technology

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Sea Surface Chemical CONTAMINATION after Shipping Accidents

ES&T's Best Papers of 2007

Testing the Accuracy of Retail Biodiesel Blends

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Research

CRITICAL REVIEW

POLICY ANALYSIS

CHARACTERIZATION OF NATURAL AND AFFECTED ENVIRONMENTS

■ 2316

Influence of Trophic Position and Spatial Location on Polychlorinated Biphenyl (PCB) Bioaccumulation in a Stream Food Web

David M. Walters,* Ken M. Fritz, Brent R. Johnson, James M. Lazorchak, and Frank H. McCormick

$\delta^{15}N$-derived trophic position strongly predicts contaminant biomagnification in streams, but biomagnification is low relative to that in marine and lentic systems.

■ 2323

Gulf of Mexico Hypoxia: Alternate States and a Legacy

R. Eugene Turner,* Nancy N. Rabalais, and Dubravko Justic

A larger dead zone is created each year for the same nutrient loading because of increased sediment oxygen demand and lack of progress from the Hypoxia Action Plan.

2328

Historical Distribution and Partitioning of Phosphorus in Sediments in an Agricultural Watershed in the Yangtze-Huaihe Region, China

Hong Zhang and Baoqing Shan*

Using ^{137}Cs proxy, the P retention history is reconstructed to evaluate effects of agricultural intensification on water quality in the watershed during the past few decades.

■ 2334

Atmospherically Deposited PBDEs, Pesticides, PCBs, and PAHs in Western U.S. National Park Fish: Concentrations and Consumption Guidelines

Luke K. Ackerman, Adam R. Schwindt, Staci L. Massey Simonich,* Dan C. Koch, Tamara F. Blett, Carl B. Schreck, Michael L. Kent, and Dixon H. Landers

PBDE, pesticide, PCB, and PAH concentrations are measured in Western U.S. national park fish and compared to human and wildlife health consumption guidelines.

ENVIRONMENTAL PROCESSES

■ 2342

Directed Synthesis of Hierarchical Nanostructured TiO_2 Catalysts and their Morphology-Dependent Photocatalysis for Phenol Degradation

Lu Liu,* Huajie Liu, Ya-Ping Zhao,* Yuqiu Wang, Yueqin Duan, Guandao Gao, Ming Ge, and Wei Chen*

TiO_2 $3D_{0D}$ microspheres (anatase nanoparticle-assembled), 1D nanorods (rutile), and $3D_{1D}$ microspheres (nanorods-assembled) exhibit the same degradation pathway for phenol degradation.

■ 2349

Mechanisms of Photocatalytical Degradation of Monomethylarsonic and Dimethylarsinic Acids Using Nanocrystalline Titanium Dioxide

Zhonghou Xu, Chuanyong Jing, Fasheng Li, and Xiaoguang Meng*

MMA and DMA are photocatalytically degradated to inorganic arsenate and organic carbon including formic acid in a nanocrystalline TiO_2-UV system.

2355

Reductive Dissolution of Pu(IV) by *Clostridium* sp. Under Anaerobic Conditions

Arokiasamy J. Francis,* Cleveland J. Dodge, and Jeffrey B. Gillow

Remobilization of Pu in subsurface environments can be brought about by the activities of anaerobic microorganisms by reductive dissolution of insoluble tetravalent Pu to its trivalent form and thus affect its long-term stability and mobility.

■ 2361

Extended X-ray Absorption Fine Structure Analysis of Arsenite and Arsenate Adsorption on Maghemite

Guillaume Morin,* Georges Ona-Nguema, Yuheng Wang, Nicolas Menguy, Farid Juillot, Olivier Proux, François Guyot, Georges Calas, and Gordon E. Brown, Jr.

EXAFS analysis indicates that arsenite and arsenate form inner-sphere complexes on the surface of maghemite with distinctly different sorption complexes for As(III) and As(V).

■ 2367

EXAFS Study on the Reactions between Iron and Fulvic Acid in Acid Aqueous Solutions

Joris W. J. van Schaik,* Ingmar Persson, Dan Berggren Kleja, and Jon Petter Gustafsson

Iron(III) forms fulvic acid complexes at pHs 2 and 4; mononuclear solution complexes and polynuclear iron(III) solid-phase complexes, even at low pH, may be phase-dependent.

■ 2374

Altitudinal Transect of Atmospheric and Aqueous Fluorinated Organic Compounds in Western Canada

Mark Loewen,* Frank Wania, Feiyue Wang, and Gregg Tomy

Passive air sampler concentrations of neutral PFASs increase over an altitudinal transect in Western Canadian mountains during the snowmelt and summer seasons while lake water concentrations of PFOS and PFCAs do not show such a relationship.

■ 2380

Redox Reactions of Phenazine Antibiotics with Ferric (Hydr)oxides and Molecular Oxygen

Yun Wang and Dianne K. Newman*

The structure−reactivity relationships for redox reactions of phenazine natural products with Fe(III) minerals and molecular oxygen are explored.

■ 2387

Measurement and Implications of Nonphotochemically Generated Superoxide in the Equatorial Pacific Ocean

Andrew L. Rose,* Eric A. Webb, T. David Waite, and James W. Moffett

Superoxide is maintained at picomolar concentrations in the Costa Rica Dome upwelling region of the equatorial Pacific Ocean by a particle-associated, nonphotochemical source.

2394

Night-Time Atmospheric Fate of Acrolein and Crotonaldehyde

M. S. Salgado,* E. Monedero, F. Villanueva, P. Martín, A. Tapia, and B. Cabañas

Absolute rate coefficients for the gas-phase reaction of the NO_3 radical with acrolein and crotonaldehyde are measured using a discharge flow system and monitoring NO_3 radical by laser induced fluorescence.

■ 2401

Thermodynamic Evaluation on H_2 Production in Glucose Fermentation

Hyung-Sool Lee,* Michael B. Salerno, and Bruce E. Rittmann

The work assesses how thermodynamics can control biohydrogen production in mesophilic glucose fermentation using mixed culture.

ENVIRONMENTAL MODELING

ENVIRONMENTAL MEASUREMENTS METHODS

■ 2496

Physical and Chemical Characterization of Residential Oil Boiler Emissions

Michael D. Hays,* Lee Beck, Pamela Barfield, Richard J. Lavrich, Yuanji Dong, and Randy L. Vander Wal

Nuclei mode particle emissions from a modern residential oil boiler comprise organosulfur compounds and a unique carbon nanostructure that may influence Northeastern U.S. air quality.

■ 2503

Particle and Gas Emissions from a Simulated Coal-Burning Household Fire Pit

Linwei Tian, Donald Lucas,* Susan L. Fischer, S. C. Lee, S. Katharine Hammond, and Catherine P. Koshland

Chinese anthracite and bituminous coals produce different amounts of emissions when burned in a fire pit that simulates common rural household use of these fuels.

■ 2509

Influence of Calcium Content of Biomass-Based Materials on Simultaneous NO_x and SO_2 Reduction

Sarma V. Pisupati* and Sumeet Bhalla

The science and technology of reduction in CO_2, SO_2, and NO_x emissions through the use of biomass is studied.

■ 2515

Transport of Methane and Noble Gases during Gas Push–Pull Tests in Variably Saturated Porous Media

Katherine Gómez,* Graciela Gonzalez-Gil, Martin H. Schroth, and Josef Zeyer

The influence of water saturation on the transport of CH_4 and tracer noble gases during gas push–pull tests in porous media is evaluated.

■ 2522

Method for Quantifying Nitromethane in Blood as a Potential Biomarker of Halonitromethane Exposure

K. Udeni Alwis,* Benjamin C. Blount, Lalith K. Silva, Mitchell M. Smith, and Karl-Hermann Loose

Nitromethane is detected in all human blood samples tested using SPME–GC–HRMS and is a potential biomarker of exposure to nitromethane and halonitromethanes.

■ 2528

Altitudinal and Seasonal Variations of Persistent Organic Pollutants in the Bolivian Andes Mountains

Victor H. Estellano,* Karla Pozo, Tom Harner, Margot Franken, and Mauricio Zaballa

Using polyurethane foam disk passive air samplers, we assess the altitudinal and seasonal variation of persistent organic pollutants in the Bolivian Andes Mountains.

REMEDIATION AND CONTROL TECHNOLOGIES

2535

Hydraulic and Pollutant Removal Performance of Fine Media Stormwater Filtration Systems

Belinda E. Hatt,* Tim D. Fletcher, and Ana Deletic

Effective retention of particulates and associated pollutants by fine media stormwater filters is also a cause of reduced hydraulic capacity due to surface clogging.

■ 2542

N-15 NMR Study of the Immobilization of 2,4- and 2,6-Dinitrotoluene in Aerobic Compost

Kevin A. Thorn,* Judith C. Pennington, Kay R. Kennedy, Larry G. Cox, Charolett A. Hayes, and Beth E. Porter

2,4-Dinitrotoluene and 2,6-dinitrotoluene undergo reductive transformation to monoamines that subsequently form covalent bonds with organic matter during aerobic composting.

■ 2551

Characterization of Copper Adsorption onto an Alginate Encapsulated Magnetic Sorbent by a Combined FT-IR, XPS, and Mathematical Modeling Study

Soh-Fong Lim, Yu-Ming Zheng, Shuai-Wen Zou, and J. Paul Chen*

Copper adsorption onto an alginate encapsulated magnetic sorbent can be better described by a combined model with ion exchange, metal–organic coordination, and surface complex formation.

2557

Influence of Surface Charge Distributions and Particle Size Distributions on Particle Attachment in Granular Media Filtration

Jinkeun Kim, Jeffrey A. Nason, and Desmond F. Lawler*

Attachment and detachment of particles to and from media and previously captured particles are highly dynamic processes involving zeta potential distributions and size distributions.

■ 2563

Absorption, Tissue Distribution, And Elimination of Residues after 2,4,6-Trinitro[^{14}C]toluene Administration to Sheep

D. J. Smith,* A. M. Craig, J. M. Duringer, and R. L. Chaney

Trinitrotoluene is rapidly transformed in sheep to metabolites that covalently bind to digesta and which are mainly excreted in feces as bound residues.

■ 2570

Capture of Dioxins by Ionic Liquids

Prashant S. Kulkarni,* Luís C. Branco, João G. Crespo, and Carlos A. M. Afonso*

Absorption and desorption of dioxin gases using thermally stable room temperature ionic liquids are demonstrated for the successful remediation of dioxins from several contaminated sources.

■ 2575

Volatilization and Biodegradation of Naphthalene in the Vadose Zone Impacted by Phytoremediation

Rikke G. Andersen, Elizabeth C. Booth, Linsey C. Marr, Mark A. Widdowson, and John T. Novak*

A major mechanism of naphthalene removal associated with phytoremediation is volatilization coupled with biodegradation enhanced by a phyto-induced lowering of the water table.

■ 2582

Stoichiometry of Coagulation Revisited

J. Y. Shin, R. F. Spinette, and C. R. O'Melia*

Relationships between optimum alum dosages and contaminant concentrations in raw water are developed and interpreted, with design and operation implications for potable water treatment facilities.

2590
Utilization of Ventilation Air Methane as a Supplementary Fuel at a Circulating Fluidized Bed Combustion Boiler

Changfu You* and Xuchang Xu

Ventilation air methane (VAM) utilization as supplementary fuel is evaluated; the experimentation shows that the VAM can be burnt completely in furnaces.

2594
Confounding Effects of Aqueous-Phase Impinger Chemistry on Apparent Oxidation of Mercury in Flue Gases

Brydger Cauch,* Geoffrey D. Silcox, JoAnn S. Lighty, Jost O. L. Wendt, Andrew Fry, and Constance L. Senior

The presence of Cl_2 in flue gas without SO_2 is found to oxidize Hg^0 in aqueous conditioning system impingers, impacting laboratory scale experimental data on gas-phase mercury oxidation.

■ 2600
Carbothermal Synthesis of Carbon-supported Nanoscale Zero-valent Iron Particles for the Remediation of Hexavalent Chromium

Laura B. Hoch, Elizabeth J. Mack, Bianca W. Hydutsky, Jessica M. Hershman, Joanna M. Skluzacek, and Thomas E. Mallouk*

The reaction at 600–800 °C of iron salts with carbon black yields carbon-supported nanoscale iron, which transports well in saturated sand and reacts rapidly with aqueous Cr(VI).

2606
Effect of Strongly Competing Background Compounds on the Kinetics of Trace Organic Contaminant Desorption from Activated Carbon

Priscilla C. To, Benito J. Mariñas,* Vernon L. Snoeyink, and Wun Jern Ng

The effect of direct surface competition by background organic matter on increasing the desorption kinetics of a trace contaminant is explored.

■ 2612
TiO_2/Ti Rotating Disk Photoelectrocatalytic (PEC) Reactor: A Combination of Highly Effective Thin-Film PEC and Conventional PEC Processes on a Single Electrode

Yunlan Xu, Yi He, Xinde Cao, Dengjie Zhong, and Jinping Jia*

A highly efficient TiO_2/Ti rotating disk photoelectrocatalytic reactor applicable to treat high concentration industrial dye effluents is developed.

SUSTAINABILITY ENGINEERING AND GREEN CHEMISTRY

■ 2618
Biobased Surfactant-Like Molecules from Organic Wastes: The Effect of Waste Composition and Composting Process on Surfactant Properties and on the Ability to Solubilize Tetrachloroethene (PCE)

Giorgia Quadri, Xiaosong Chen, James W. Jawitz, Fulvia Tambone, Pierluigi Genevini, Franco Faoro, and Fabrizio Adani*

Organic wastes are evaluated as a source of natural surfactants to enhance tetrachloroethene (PCE) water solubility.

2624
Sustainability of Uranium Mining and Milling: Toward Quantifying Resources and Eco-Efficiency

Gavin M. Mudd* and Mark Diesendorf

Data on uranium resources and energy, water, and greenhouse sustainability of uranium production are compiled, showing their sensitivity to deposit ore grade.

■ 2631
Volatile Organic Compounds Absorption in a Cross-Flow Rotating Packed Bed

Yu-Shao Chen, Yi-Chun Hsu, Chia-Chang Lin, Clifford Yi-Der Tai, and Hwai-Shen Liu*

Absorption performance of VOCs in a cross-flow rotating packed bed is evaluated, and a correlation of $K_G a$ is proposed for the first time.

■ 2637
The Effect of pH on Thiosulfate Formation in a Biotechnological Process for the Removal of Hydrogen Sulfide from Gas Streams

Pim L. F. van den Bosch,* Dimitry Y. Sorokin, Cees J. N. Buisman, and Albert J. H. Janssen

A new biotechnological process is described to remove hydrogen sulfide from sour gases as produced in the petrochemical industry.

ECOTOXICOLOGY AND HUMAN ENVIRONMENTAL HEALTH

■ 2643
Coupling Hydrologic and Infectious Disease Models To Explain Regional Differences in Schistosomiasis Transmission in Southwestern China

Justin Remais,* Song Liang, and Robert C. Spear

The impact of hydrology on disease transmission is explored by coupling a lumped parameter rainfall-runoff model with a delay-differential equation schistosomiasis transmission model.

■ 2650
Hexabromocyclododecane in White-Sided Dolphins: Temporal Trend and Stereoisomer Distribution in Tissues

Aaron M. Peck,* Rebecca S. Pugh, Amanda Moors, Michael B. Ellisor, Barbara J. Porter, Paul R. Becker, and John R. Kucklick

Trends in hexabromocyclododecane diastereomer concentrations and enantiomeric distributions in white-sided dolphins stranded on the eastern coast of the United States between 1993 and 2004 are reported.

■ 2656
Effects of Diesel on Survival, Growth, and Gene Expression in Rainbow Trout (*Oncorhynchus mykiss*) Fry

Lizzy Mos,* Glenn A. Cooper, Kerrie Serben, Marc Cameron, and Ben F. Koop

Microarrays supply information on the mechanism of short-term effects (oxygen deprivation) and potential long-term impacts (feminization, immune system alterations) of diesel exposure on salmonids.

■ 2663
Polycyclic Aromatic Hydrocarbons in Human Milk of Nonsmoking U.S. Women

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

Measurements suggest that average exposure of breastfed U.S. infants is comparable to that reported for European and Asian women, suggesting that health benefits from nursing outweigh risks from PAHs in milk.

CORRESPONDENCE AND REBUTTAL

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