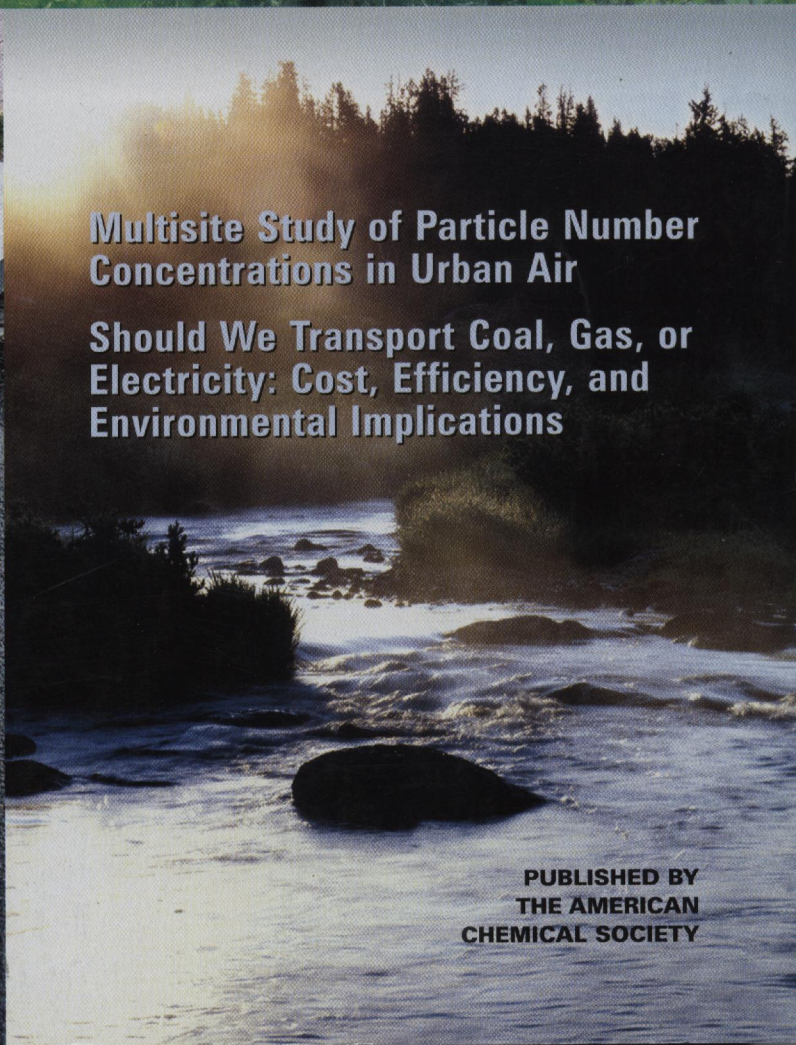


August 15, 2005

ENVIRONMENTAL Science & Technology

<http://pubs.acs.org/est>

**GREEN Engineering
Principles *Promote*
Low-Impact Development**



**Multisite Study of Particle Number
Concentrations in Urban Air**

**Should We Transport Coal, Gas, or
Electricity: Cost, Efficiency, and
Environmental Implications**

**PUBLISHED BY
THE AMERICAN
CHEMICAL SOCIETY**

Policy Analysis

■ 5905

Should We Transport Coal, Gas, or Electricity: Cost, Efficiency, and Environmental Implications

Joule A. Bergerson and Lester B. Lave

Transporting energy over long distances—from coal mine to electricity consumer—can be done in several ways, each with different life-cycle costs and environmental implications.

■ 5911

Use of Expert Judgment to Bound Lung Cancer Risks

Elizabeth A. Casman and M. Granger Morgan

A method for inferring the upper bound on the magnitude of the poorly quantified risk factors is demonstrated for diseases that have more than one risk factor.

■ 5921

Can Reducing Black Carbon Emissions Counteract Global Warming?

Tami C. Bond and Haolin Sun

Both scientific and practical issues are considered in this study, which shows that decreasing aerosol emissions reduces human impacts on climate but that a separate climate agreement is warranted.

Characterization of Natural and Affected Environments

5927

Trace Metal Exposure of Soil Bacteria Depends on Their Position in the Soil Matrix

Åsgeir R. Almas, Jan Mulder, and Lars R. Bakken

The spatial heterogeneity of microbial communities in soils is important for developing tolerance to zinc and cadmium.

5933

Thioarsenates in Sulfidic Waters

S. Stauder, B. Raue, and F. Sacher

In sulfate-reducing environments, oxidation of neutral arsenous acid to anionic thioarsenates must be taken into account for the mobility and toxicity of arsenic to be understood.

■ 5940

Coastal Water Quality Impact of Stormwater Runoff from an Urban Watershed in Southern California

Jong Ho Ahn, Stanley B. Grant, Cristiane Q. Surbeck, Paul M. DiGiacomo, Nikolay P. Nezhin, and Sunny Jiang

The impact of stormwater runoff depends on prevailing ocean currents; within-plume processing of particles and pathogens; and the timing, magnitude, and nature of runoff discharged from river outlets.

■ 5954

Differential Accumulation of Polychlorinated Biphenyl Congeners in the Terrestrial Food Web of the Kalamazoo River Superfund Site, Michigan

Alan L. Blankenship, Matthew J. Zwiernik, Katherine K. Coady, Denise P. Kay, John L. Newsted, Karl Strause, Cyrus Park, Patrick W. Bradley, Arianne M. Neigh, Stephanie D. Millsap, Paul D. Jones, and John P. Giesy

PCB congeners differentially accumulate in a terrestrial food web because of congener-specific differences in bioavailability from soil, exposure pathways, and metabolic potentials.

■ 5964

Differential Accumulation of Polychlorinated Biphenyl Congeners in the Aquatic Food Web at the Kalamazoo River Superfund Site, Michigan

Denise P. Kay, Alan L. Blankenship, Katherine K. Coady, Arianne M. Neigh, Matthew J. Zwiernik, Stephanie D. Millsap, Karl Strause, Cyrus Park, Patrick Bradley, John L. Newsted, Paul D. Jones, and John P. Giesy

The relative potency of PCBs, expressed as the ratio of total 2,3,7,8-tetrachlorodibenzo-*p*-dioxin equivalents to total PCBs, increases with trophic position in avian and mammalian aquatic food webs.

5975

Assessment of Degradation Pathways in an Aquifer with Mixed Chlorinated Hydrocarbon Contamination Using Stable Isotope Analysis

Daniel Hunkeler, Ramon Aravena, Karen Berry-Spark, and Evan Cox

Compound-specific carbon isotope ratios can be used to constrain and quantify degradation pathways at sites with complex mixtures of chlorinated ethanes, ethenes, and methanes.

5982

Advanced Oxidation of Caffeine in Water: On-Line and Real-Time Monitoring by Electrospray Ionization Mass Spectrometry

Ilza Dalmázio, Leonardo S. Santos, Renata P. Lopes, Marcos N. Eberlin, and Rodinei Augusti

On-line and real-time monitoring of advanced oxidation of caffeine is performed under the oxidative conditions of UV/H₂O₂, TiO₂/UV, and Fenton systems to determine intermediates and products.

■ 5989

Comparison of Atmospheric Deposition of Copper, Nickel, Cobalt, Zinc, and Cadmium Recorded by Finnish Peat Cores with Monitoring Data and Emission Records

Nicole Rausch, Tiina Nieminen, Liisa Ukonmaanaho, Gaël Le Roux, Michael Krachler, Andriy K. Cheburkin, Georges Bonani, and William Shotyck

The ability of ombrotrophic bogs to preserve the chronology of atmospheric trace metals depends on the element, its mineralogical form, and the deposition rate.

5999

Arsenic Occurrence and Species in Near-Shore Macroalgae-Feeding Marine Animals

J. Kirby, W. Maher, and D. Spooner

Identified arsenic compounds include a trimethylated glycerol arsenoribose in macroalgae-feeding marine animals, which are directly exposed to dimethylated arsenoriboses through their diet.

■ 6006

Trace Analysis of Semivolatile Organic Compounds in Large Volume Samples of Snow, Lake Water, and Groundwater

Sascha Usenko, Kimberly J. Hageman, Dave W. Schmedding, Glenn R. Wilson, and Staci L. Simonich

A new analytical method is described for measuring a wide range of semivolatile organic compounds in large-volume aqueous samples.

6016

Hair as an Indicator of Endogenous Tissue Levels of Brominated Flame Retardants in Mammals

Helga D'Havé, Adrian Covaci, Jan Scheirs, Paul Schepens, Ron Verhagen, and Wim De Coen

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

Hair is a suitable indicator of brominated flame retardant levels in mammals and can be used in nondestructive monitoring schemes.

6021

Flame Retardants and Methoxylated and Hydroxylated Polybrominated Diphenyl Ethers in Two Norwegian Arctic Top Predators: Glaucous Gulls and Polar Bears

Jonathan Verreault, Geir W. Gabrielsen, Shaogang Chu, Derek C. G. Muir, Magnus Andersen, Ahmad Hamaed, and Robert J. Letcher

Novel brominated flame retardants and methoxylated and hydroxylated PBDEs are detected in glaucous gulls and polar bears from the Norwegian Arctic.

Environmental Processes

6029

Transformation and Removal of Bisphenol A from Aqueous Phase via Peroxidase-Mediated Oxidative Coupling Reactions: Efficacy, Products, and Pathways

Qingguo Huang and Walter J. Weber, Jr.

A systematic investigation is described of the transformation and removal of bisphenol A from the aqueous phase via horseradish-peroxidase-mediated oxidative coupling.

■ **6037**

Siderophore–Manganese(III) Interactions. I. Air-Oxidation of Manganese(II) Promoted by Desferrioxamine B

Owen W. Duckworth and Garrison Sposito

The trihydroxamate siderophore desferrioxamine B forms stable complexes with Mn(II) and Mn(III) and promotes air oxidation of Mn(II) at circumneutral pH.

■ **6045**

Siderophore–Manganese(III) Interactions. II. Manganite Dissolution Promoted by Desferrioxamine B

Owen W. Duckworth and Garrison Sposito

The trihydroxamate siderophore desferrioxamine B promotes the dissolution of manganite by both reductive and ligand-promoted reaction pathways.

■ **6052**

Carbon Isotope Fractionation of Organic Contaminants Due to Retardation on Humic Substances: Implications for Natural Attenuation Studies in Aquifers

Frank-Dieter Kopinke, Anett Georgi, Michael Voskamp, and Hans H. Richnow

Carbon isotope fractionation factors due to sorption on natural organic material are determined from batch and chromatographic experiments; implications for fractionation processes in contaminated aquifers are discussed.

6063

Multisite Study of Particle Number Concentrations in Urban Air

Roy M. Harrison and Alan M. Jones

Particle number concentration data, obtained over a period of four years, are reported from eight urban sites in the U.K.

6071

Photodegradation of Antibiotics on Soil Surfaces: Laboratory Studies on Sulfadiazine in an Ozone-Controlled Environment

André Wolters and Markus Steffens

Drying out the top soil layer under field conditions enables sorption of surface-applied antibiotics to soil dust and may facilitate photodegradation at the soil–atmosphere interface.

6079

▶ **Common Pesticide Increases Costs of Antipredator Defenses in *Rana temporaria* Tadpoles**

Céline Teplitsky, Henna Piha, Anssi Laurila, and Juha Merilä

A laboratory experiment demonstrates the synergistic, negative effects of fungicide and predation risk on amphibian development.

6086

Kinetics of Aqueous Ozone-Induced Oxidation of Some Endocrine Disruptors

Marie Deborde, Sylvie Rabouan, Jean-Pierre Duguet, and Bernard Legube

The kinetics of aqueous ozone-induced oxidation of six endocrine disruptors are studied over a wide range of pH conditions to assess their fate under water-treatment conditions.

6093

Configurations of the Bentonite-Sorbed Myristylpyridinium Cation and Their Influences on the Uptake of Organic Compounds

Baoliang Chen, Lizhong Zhu, Jiangxi Zhu, and Baoshan Xing

A change in the configuration of the mineral-sorbed surfactant confined by clay layers leads to an adsorption-to-partition transition in the organoclay uptake of nonionic organic compounds.

6101

Kinetics of Arsenate Adsorption–Desorption in Soils

Hua Zhang and H. M. Selim

Arsenate adsorption and desorption by soils is nonlinear and time-dependent; it is described by a multireaction model with equilibrium/kinetic retention and irreversible mechanisms.

6109

Influence of the Composition of Natural Organic Matter on Pb Bioavailability to Microalgae

Cristina Lamelas, Kevin J. Wilkinson, and Vera I. Slaveykova

The composition of natural organic matter influences both lead bioavailability and speciation.

6117

Infrared Spectroscopic Studies of Galvanic Effect Influence on Surface Modification of Sulfide Minerals by Surfactant Adsorption

Ela Mielczarski and Jerzy A. Mielczarski

Galvanic interactions between grains of different natural minerals could have tremendous impacts on the adsorption of surfactant on each mineral and their future reactivity.

6123

Quantifying the Effect of Medium Composition on the Diffusive Mass Transfer of Hydrophobic Organic Chemicals through Unstirred Boundary Layers

Philipp Mayer, Ulrich Karlson, Peter S. Christensen, Anders R. Johnsen, and Stefan Trapp

A simple microscale technique demonstrates that humic acids and surfactant micelles can enhance the diffusive mass transfer of the model substance fluoranthene.

6130

Solar Photolysis of CH₂I₂, CH₂ClI, and CH₂IBr in Water, Saltwater, and Seawater

Charlotte E. Jones and Lucy J. Carpenter

Rates, quantum yields, and photoproducts of the photolysis of aqueous CH₂I₂, CH₂ClI, and CH₂IBr are presented, and the impact on the marine environment is discussed.

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

6138

Sorption of Polar and Nonpolar Aromatic Organic Contaminants by Plant Cuticular Materials: Role of Polarity and Accessibility

Baoliang Chen, Elizabeth J. Johnson, Benny Chefetz, Lizhong Zhu, and Baoshan Xing

Polarity and accessibility play a regulating role in the sorption of polar and nonpolar aromatic organic pollutants by natural plant cuticular materials.

6147

Fenton Chemistry of Fe^{III}-Exchanged Zeolitic Minerals Treated with Antioxidants

Toni A. Ruda and Prabir K. Dutta

Fe^{III}-exchanged mineral fibers reduced by biologically relevant antioxidants exhibit profound differences in Fenton activity controlled by the minerals' surface structure.

6153

Nucleation Particles in Diesel Exhaust: Composition Inferred from In Situ Mass Spectrometric Analysis

J. Schneider, N. Hock, S. Weimer, S. Borrmann, U. Kirchner, R. Vogt, and V. Scheer

Formation of nucleation-mode particles from diesel exhaust occurs only under certain conditions: high sulfur content of fuel, high engine load, and an appropriate exhaust-gas dilution.

6162

Reoxidation of Bioreduced Uranium under Reducing Conditions

Jiamin Wan, Tetsu K. Tokunaga, Eoin Brodie, Zheming Wang, Zuoping Zheng, Don Herman, Terry C. Hazen, Mary K. Firestone, and Stephen R. Sutton

Bioreduction of uranium in sediments can be transient—even under reducing conditions—because respiration increases bicarbonate concentrations, forms uranyl carbonate complexes, and favors U(IV) oxidation.

6170

Relating Desorption and Biodegradation of Phenanthrene to SOM Structure Characterized by Quantitative Pyrolysis GC-MS

Naoko Watanabe, Egbert Schwartz, Kate M. Scow, and Thomas M. Young

Four soils are extensively studied to investigate linkages among soil composition, sorption/desorption equilibria and rates, and biodegradation.

Environmental Modeling

6182

Novel Quantification of Coupled Natural and Cross-Sectoral Water and Nutrient/Pollutant Flows for Environmental Management

Christian Baresel and Georgia Destouni

Nitrogen loads and abatement scenario implications are quantified for both natural water systems and sectors in the Swedish Norrström drainage basin.

Environmental Measurements Methods

6191

Miniaturized Redox Potential Probe for In Situ Environmental Monitoring

Am Jang, Jin-Hwan Lee, Prashant R. Bhadri, Suresh A. Kumar, William Timmons, Fred R. Beyette, Jr., Ian Papautsky, and Paul L. Bishop

An integrated microelectrode and microprocessor was developed and fully characterized for environmental measurement of oxidation-reduction potential.

6198

Chemical Oxygen Demand Using Closed Microwave Digestion System

Dattatray M. Dharmadhikari, Atul P. Vanerkar, and Nivedita M. Barhate

A closed microwave digestion system for determining chemical oxygen demand is proposed to replace the conventional open reflux method.

6202

Development of a Compound-Specific Isotope Analysis Method for Atmospheric Formaldehyde and Acetaldehyde

Sheng Wen, Yanli Feng, Yingxin Yu, Xinhui Bi, Xinming Wang, Guoying Sheng, Jiamo Fu, and Ping'an Peng

Formaldehyde and acetaldehyde standards are used to test $\delta^{13}\text{C}$ relationships and fractionation in solutions and in simulations after derivatization with DNPH of known isotope composition.

Remediation and Control Technologies

6208

Treatment of Hexavalent Chromium in Chromite Ore Processing Solid Waste Using a Mixed Reductant Solution of Ferrous Sulfate and Sodium Dithionite

Chunming Su and Ralph D. Ludwig

Sodium dithionite enhances the stability of ferrous iron and facilitates the dissemination of injected ferrous iron for hexavalent chromium treatment.

6217

Inorganic-Organic Phase Arrangement as a Factor Affecting Gas-Phase Desulfurization on Catalytic Carbonaceous Adsorbents

Adil Ansari and Teresa J. Bandosz

Although some microporosity is necessary to increase the storage area for oxidation products, the carbonaceous phase need not be highly porous but should provide space for sulfur deposition.

6225

Enhancement of the Performance of Activated Carbons as Municipal Odor Removal Media by Addition of a Sewage-Sludge-Derived Phase

Evilambia Sioukri and Teresa J. Bandosz

Mixing provides active centers for oxidation from sludge and a developed pore system from activated carbon, where products of oxidation can be stored.

6231

Impregnated Active Carbons to Control Atmospheric Emissions: Influence of Impregnation Methodology and Raw Material on the Catalytic Activity

Maria C. M. Alvim-Ferraz and Carla M. T. B. Gaspar

When impregnation is performed before activation, the metal species act as catalysts during the activation step; this allows better catalyst distribution on a well-developed mesoporous surface.

6237

Reduction of Chlorinated Ethanes by Nanosized Zero-Valent Iron: Kinetics, Pathways, and Effects of Reaction Conditions

Hocheol Song and Elizabeth R. Carraway

Reductive dechlorination of eight chlorinated ethanes by laboratory-synthesized nanosized zero-valent iron particles is shown to be effective for all compounds except dichlorinated species.

6246

Bisphenol A Removal from Water by Activated Carbon. Effects of Carbon Characteristics and Solution Chemistry

I. Bautista-Toledo, M. A. Ferro-García, J. Rivera-Utrilla, C. Moreno-Castilla, and F. J. Vegas Fernández

Bisphenol A adsorption depends on the chemical nature of the carbon surface and on the solution pH, which is most favorable when carbon net charge density is zero.

■ 6251

Visible Light Cr(VI) Reduction and Organic Chemical Oxidation by TiO₂ Photocatalysis

Bo Sun, Ettireddy P. Reddy, and Panagiotis G. Smirniotis

Combining TiO₂, Cr(VI), and 4-chlorophenol allows synergistic Cr(VI) reduction and 4-chlorophenol oxidation under visible light; the specific roles of these ingredients are studied parametrically.

6260

Reducing the Emission of Particles from a Diesel Engine by Adding an Oxygenate to the Fuel

Kent E. Nord and Dan Haupt

A mixture of acetal and regular diesel fuel is tested in a heavy-duty diesel engine in an effort to reduce emissions.

6266

Controlling Reduction Potentials of Semiconductor-Supported Molecular Catalysts for Environmental Remediation of Organohalide Pollutants

Sherine O. Obare, Tamae Ito, and Gerald J. Meyer

Reduction potentials of iron(III) protoporphyrin chloride and cobalt(III) meso-tetra(4-carboxyphenyl) porphyrin chloride catalysts are quantified in solution and when attached to nanocrystalline TiO₂.

■ 6273

Orthophosphate Sorption onto Lanthanum-Treated Lignocellulosic Sorbents

Eun Woo Shin, K. G. Karthikeyan, and Mandla A. Tshabalala

A detailed investigation is presented of orthophosphate sorption on lanthanum-treated bark, a biobased hybrid organic/inorganic sorbent.

■ 6280

Copper Stabilization by Zeolite Synthesis in Polluted Soils Treated with Coal Fly Ash

Roberto Terzano, Matteo Spagnuolo, Luca Medici, Bart Vekemans, Laszlo Vincze, Koen Janssens, and Pacifico Ruggiero

Synthesis of zeolites in an artificially copper-polluted soil treated with fused coal fly ash can entrap metal precipitates in their structures.

6288

Use of In Situ-Generated Dimethyldioxirane for Inactivation of Biological Agents

William H. Wallace, Karen E. Bushway, Susan D. Miller, Carrie A. Delcomyn, Jean J. Renard, and Michael V. Henley

An aqueous solution of dimethyldioxirane is investigated as an environmentally acceptable decontaminant for inactivation of biological agents.

6293

Membrane Fouling in Pilot-Scale Membrane Bioreactors (MBRs) Treating Municipal Wastewater

Katsuki Kimura, Nobuhiro Yamato, Hiroshi Yamamura, and Yoshimasa Watanabe

The effect of operating conditions on membrane fouling in MBRs and the characteristics of the foulants are investigated.

6300

Ultrasonically Induced Degradation and Detoxification of Microcystin-LR (Cyanobacterial Toxin)

Weihua Song, Terri Teshiba, Kathleen Rein, and Kevin E. O'Shea

Microcystin degradation by ultrasonic irradiation is studied under various conditions; results suggest that both hydroxyl radical and non-hydroxyl radical reactions are important in degradation.

6306

Field Column Study Using Zerovalent Iron for Mercury Removal from Contaminated Groundwater

Christopher G. Weisener, K. Scott Sale, David J. A. Smyth, and David W. Blowes

Zerovalent iron field column trials were performed to remove mercury from a contaminated site; solid-phase controls were investigated.

■ 6313

Gene Expression Changes in *Arabidopsis thaliana* Seedling Roots Exposed to the Munition Hexahydro-1,3,5-trinitro-1,3,5-triazine

Drew R. Ekman, N. Lee Wolfe, and Jeffrey F. D. Dean

Transcriptional profiling identifies genes in *Arabidopsis* that respond to RDX and shows the responses to be different from those seen in TNT-treated plants.

■ 6321

Hexavalent Chromium Removal by Reduction with Ferrous Sulfate, Coagulation, and Filtration: A Pilot-Scale Study

Gang Qin, Michael J. McGuire, Nicole K. Blute, Chad Seidel, and Leighton Fong

Influent Cr(VI) concentrations of 100 µg/L can be lowered below detectable levels and total chromium [Cr(VI) plus Cr(III)] decreased to <5 µg/L.

Sustainability Engineering and Green Chemistry

6328

In Situ Electrooxidation of Photobiological Hydrogen in a Photobioelectrochemical Fuel Cell Based on *Rhodobacter sphaeroides*

Miriam Rosenbaum, Uwe Schröder, and Fritz Scholz

A photobiological fuel cell is presented that uses the metabolic activity of the purple bacterium *Rhodobacter sphaeroides* to generate electricity.

Correspondence and Rebuttal

6334

Comment on "Co-Occurrence of Triclocarban and Triclosan in U.S. Water Resources"

Hans Sanderson

6335

Response to Comment on "Co-Occurrence of Triclocarban and Triclosan in U.S. Water Resources"

Rolf U. Halden and Daniel H. Paull

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