

111
E 54/S

ENVIRONMENTAL Science & Technology

January 15, 2013
Volume 47
Number 2
pubs.acs.org/est



ADVANCED BULBS:
Metallic content
entreats lifecycle
questions



ACS Publications
MOST TRUSTED. MOST CITED. MOST READ.

www.acs.org

ON THE COVER: Artificial lighting systems such as compact fluorescent lamp (CFL) and light-emitting diode (LED) bulbs are known to be more energy efficient than incandescent bulbs. Without taking other aspects of the bulb lifecycle into account, replacing incandescents is the clear choice for policy makers. However, the metallic content of existing CFL and LED bulbs is significantly higher. Work featured on the cover of this issue explores the potential environmental impacts of this metal content and the need for careful end-of-life waste management of CFL and LED bulbs.

Viewpoints

659

[dx.doi.org/10.1021/es305111u](https://doi.org/10.1021/es305111u)

Emissions from Postcombustion CO₂ Capture Plants
Eirik Falck da Silva and Andy M. Booth*

Critical Reviews

661

[dx.doi.org/10.1021/es3030148](https://doi.org/10.1021/es3030148)

Global Synthesis and Critical Evaluation of Pharmaceutical Data Sets Collected from River Systems
Stephen R. Hughes,* Paul Kay, and Lee E. Brown

Policy Analysis

678



[dx.doi.org/10.1021/es303776g](https://doi.org/10.1021/es303776g)

Mainstreaming Carbon Management in Healthcare Systems: A Bottom-Up Modeling Approach
Adam S. Pollard, Timothy J. Taylor, Lora E. Fleming, Will Stahl-Timmins, Michael H. Depledge, and Nicholas J. Osborne*

687



[dx.doi.org/10.1021/es3029236](https://doi.org/10.1021/es3029236)

Quantitative Uncertainty Analysis of Life Cycle Assessment for Algal Biofuel Production
Deborah L. Sills,* Vidia Paramita, Michael J. Franke, Michael C. Johnson, Tal M. Akabas, Charles H. Greene, and Jefferson W. Tester

Articles

Characterization of Natural and Affected Environments

695



[dx.doi.org/10.1021/es302566w](https://doi.org/10.1021/es302566w)

Methylmercury Production in Estuarine Sediments: Role of Organic Matter
Amina T. Schartup,* Robert P. Mason, Prentiss H. Balcom, Terill A. Hollweg, and Celia Y. Chen

701  [dx.doi.org/10.1021/es3031566](https://doi.org/10.1021/es3031566)
Comparison of Sedimentary PAHs in the Rivers of Ammer (Germany) and Liangtan (China): Differences between Early- and Newly-Industrialized Countries
Ying Liu, Barbara Beckingham, Hermann Ruegner, Zhe Li, Limin Ma, Marc Schwientek, Huan Xie, Jianfu Zhao,* and Peter Grathwohl*

710  [dx.doi.org/10.1021/es3037803](https://doi.org/10.1021/es3037803)
Occurrence of Perfluoroalkyl Acids Including Perfluorooctane Sulfonate Isomers in Huai River Basin and Taihu Lake in Jiangsu Province, China
Nanyang Yu, Wei Shi, Beibei Zhang, Guanyong Su, Jianfang Feng, Xiaowei Zhang, Si Wei,* and Hongxia Yu*

718  [dx.doi.org/10.1021/es3041829](https://doi.org/10.1021/es3041829)
Impact of Ag Nanoparticle Exposure on *p,p'*-DDE Bioaccumulation by *Cucurbita pepo* (Zucchini) and *Glycine max* (Soybean)
Roberto De La Torre-Roche, Joseph Hawthorne, Craig Musante, Baoshan Xing, Lee A. Newman, Xingmao Ma, and Jason C. White*

726  [dx.doi.org/10.1021/es3042065](https://doi.org/10.1021/es3042065)
Unresolved Complex Mixture (UCM) in Coastal Environments Is Derived from Fossil Sources
Helen K. White,* Li Xu, Paul Hartmann, James G. Quinn, and Christopher M. Reddy

732  [dx.doi.org/10.1021/es304237m](https://doi.org/10.1021/es304237m)
Behavior, Fate, and Mass Loading of Short Chain Chlorinated Paraffins in an Advanced Municipal Sewage Treatment Plant
Lixi Zeng, Huijuan Li, Thanh Wang, Yan Gao, Ke Xiao, Yuguo Du, Yawei Wang,* and Guibin Jiang

Environmental Processes

741  [dx.doi.org/10.1021/es303603j](https://doi.org/10.1021/es303603j)
Electrochemical and Colorimetric Measurements Show the Dominant Role of FeS in a Permanently Anoxic Lake
Elvira Bura-Nakić, Eric Viollier, and Irena Ciglenečki*

750  [dx.doi.org/10.1021/es304057y](https://doi.org/10.1021/es304057y)
Silicate Glass Alteration Enhanced by Iron: Origin and Long-Term Implications
A. Michelin, E. Burger, D. Rebiscoul, D. Neff, F. Bruguier, E. Drouet, P. Dillmann, and S. Gin*

757  [dx.doi.org/10.1021/es302305f](https://doi.org/10.1021/es302305f)
Interactions of Aqueous Ag⁺ with Fulvic Acids: Mechanisms of Silver Nanoparticle Formation and Investigation of Stability
Nathaniel F. Adegboyega, Virender K. Sharma,* Karolina Siskova, Radek Zboril, Mary Sohn, Brian J. Schultz, and Sarbjit Banerjee

765  [dx.doi.org/10.1021/es301866f](https://doi.org/10.1021/es301866f)
Simulated Solar Light Phototransformation of Organophosphorus Azinphos Methyl at the Surface of Clays and Goethite
Matthieu Menager and Mohamed Sarakha*

773  [dx.doi.org/10.1021/es302712a](https://doi.org/10.1021/es302712a)
Onboard Measurements of Nanoparticles from a SCR-Equipped Marine Diesel Engine
Åsa M. Hallquist,* Erik Fridell, Jonathan Westerlund, and Mattias Hallquist

781  [dx.doi.org/10.1021/es3028567](https://doi.org/10.1021/es3028567)
Aerosol–Water Distribution of PCDD/Fs and PCBs in the Baltic Sea Region
Anna Sobek,* Hans Peter H. Arp, Karin Wiberg, Jenny Hedman, and Gerard Cornelissen*

790  [dx.doi.org/10.1021/es303343u](https://doi.org/10.1021/es303343u)
Use of Cl and C Isotopic Fractionation to Identify Degradation and Sources of Polychlorinated Phenols: Mechanistic Study and Field Application
Christoph Aeppli,* Mats Tysklind, Henry Holmstrand, and Örjan Gustafsson

798  [dx.doi.org/10.1021/es3033499](https://doi.org/10.1021/es3033499)
Ion-Exchange Affinity of Organic Cations to Natural Organic Matter: Influence of Amine Type and Nonionic Interactions at Two Different pHs
Steven T. J. Droge* and Kai-Uwe Goss

807  [dx.doi.org/10.1021/es303582u](https://doi.org/10.1021/es303582u)
Determination and Occurrence of Retinoids in a Eutrophic Lake (Taihu Lake, China): Cyanobacteria Blooms Produce Teratogenic Retinal
Xiaoqin Wu, Jieqiong Jiang, and Jianying Hu*


815  [dx.doi.org/10.1021/es3037862](https://doi.org/10.1021/es3037862)
Photochemical Renoxification of Nitric Acid on Real Urban Grime
Alyson M. Baergen and D. J. Donaldson*

821  [dx.doi.org/10.1021/es303794d](https://doi.org/10.1021/es303794d)
Transport of Biochar Particles in Saturated Granular Media: Effects of Pyrolysis Temperature and Particle Size
Dengjun Wang, Wei Zhang, Xiuzhen Hao, and Dongmei Zhou*

829  [dx.doi.org/10.1021/es303876h](https://doi.org/10.1021/es303876h)
Hydroxyl Radical Production by H₂O₂-Mediated Oxidation of Fe(II) Complexed by Suwannee River Fulvic Acid Under Circumneutral Freshwater Conditions
Christopher J. Miller, Andrew L. Rose, and T. David Waite*

836  [dx.doi.org/10.1021/es303995s](https://doi.org/10.1021/es303995s)
Biofouling Control with Bead-Entrapped Quorum Quenching Bacteria in Membrane Bioreactors: Physical and Biological Effects
Sang-Ryoung Kim, Hyun-Suk Oh, Sung-Jun Jo, Kyung-Min Yeon, Chung-Hak Lee,* Dong-Joon Lim, Chi-Ho Lee, and Jung-Kee Lee

843  dx.doi.org/10.1021/es3041972
Dissipation and Enantioselective Degradation of Plant Growth Retardants Paclobutrazol and Uniconazole in Open Field, Greenhouse, and Laboratory Soils
Chengwang Wu, Jianqiang Sun, Anping Zhang,* and Weiping Liu


850  dx.doi.org/10.1021/es304454g
Adsorption of Uranium(VI) to Manganese Oxides: X-ray Absorption Spectroscopy and Surface Complexation Modeling
Zimeng Wang, Sung-Woo Lee, Jeffrey G. Catalano, Juan S. Lezama-Pacheco, John R. Bargar, Bradley M. Tebo, and Daniel E. Giammar*

Environmental Modeling

859  dx.doi.org/10.1021/es303316d
Indoor Residence Times of Semivolatile Organic Compounds: Model Estimation and Field Evaluation
Hyeong-Moo Shin,* Thomas E. McKone, Nicolle S. Tulve, Matthew S. Clifton, and Deborah H. Bennett

868  dx.doi.org/10.1021/es3020277
An Improved Screening Tool for Predicting Volatilization of Pesticides Applied to Soils
Cleo L. Davie-Martin, Kimberly J. Hageman,* and Yu-Ping Chin

877  dx.doi.org/10.1021/es302152v
Environmental Impacts of Dietary Recommendations and Dietary Styles: Germany As an Example
Toni Meier* and Olaf Christen

889  dx.doi.org/10.1021/es302376d
Analyses of Turbulent Flow Fields and Aerosol Dynamics of Diesel Engine Exhaust Inside Two Dilution Sampling Tunnels Using the CTAG Model
Yan Jason Wang, Bo Yang, Eric M. Lipsky, Allen L. Robinson, and K. Max Zhang*


899  dx.doi.org/10.1021/es303401b
Spatial and Temporal Trends in Lake Erie Hypoxia, 1987–2007
Yuntao Zhou,* Daniel R. Obenour, Donald Scavia, Thomas H. Johengen, and Anna M. Michalak

906  dx.doi.org/10.1021/es303441x
Examination of the Influence of Environmental Factors on Contaminant Vapor Concentration Attenuation Factors Using the U.S. EPA's Vapor Intrusion Database
Yijun Yao, Rui Shen, Kelly G. Pennell, and Eric M. Suuberg*

914  dx.doi.org/10.1021/es3034318
Investigating the Impact of Aqueous-Phase Chemistry and Wet Deposition on Organic Aerosol Formation Using a Molecular Surrogate Modeling Approach
Florian Couvidat,* Karine Sartelet, and Christian Seigneur

923  dx.doi.org/10.1021/es304276g
Exploring the Role of Shelf Sediments in the Arctic Ocean in Determining the Arctic Contamination Potential of Neutral Organic Contaminants
James M. Armitage,* Sung-Deuk Choi, Torsten Meyer, Trevor N. Brown, and Frank Wania

Environmental Measurements Methods


932  dx.doi.org/10.1021/es304662w
Microfluidic Paper-Based Analytical Device for Aerosol Oxidative Activity
Yupaporn Sameenoi, Pantila Panymeesamer, Natcha Supalakorn, Kirsten Koehler, Orawon Chailapakul, Charles S. Henry,* and John Volckens*

941  dx.doi.org/10.1021/es303165u
Sorptive Physiologically Based Extraction of Contaminated Solid Matrices: Incorporating Silicone Rod As Absorption Sink for Hydrophobic Organic Contaminants
Varvara Gouliarmou,* Chris D. Collins, Ellen Christiansen, and Philipp Mayer

949  dx.doi.org/10.1021/es303448g
Optimized Demineralization Technique for the Measurement of Stable Isotope Ratios of Nonexchangeable H in Soil Organic Matter
Marc Ruppenthal,* Yvonne Oelmann, and Wolfgang Wilcke

958  dx.doi.org/10.1021/es303640b
Temporal Variability in Urinary Phthalate Metabolite Excretion Based on Spot, Morning, and 24-h Urine Samples: Considerations for Epidemiological Studies
Hanne Frederiksen, Selma K. Kranich, Niels Jørgensen, Olivier Taboureau, Jørgen H. Petersen, and Anna-Maria Andersson*


968  dx.doi.org/10.1021/es303848x
Automated Flux Chamber for Investigating Gas Flux at Water–Air Interfaces
Nguyen Thanh Duc,* Samuel Silverstein, Lars Lundmark, Henrik Reyier, Patrick Crill, and David Bastviken

976  dx.doi.org/10.1021/es303888v
Screening of Lake Sediments for Emerging Contaminants by Liquid Chromatography Atmospheric Pressure Photoionization and Electrospray Ionization Coupled to High Resolution Mass Spectrometry
Aurea C. Chiaia-Hernandez, Martin Krauss, and Juliane Hollender*


987  dx.doi.org/10.1021/es3040686
Biofilm Detection in Natural Unconsolidated Porous Media Using a Low-Field Magnetic Resonance System
Alexis B. Sanderlin, Sarah J. Vogt, Elliot Grunewald, Bridget A. Bergin, and Sarah L. Codd*

993  [dx.doi.org/10.1021/es3034928](https://doi.org/10.1021/es3034928)
Novel Instruments for in Situ Continuous Rn-222 Measurement in Groundwater and the Application to River Bank Infiltration
B. S. Gilfedder,* H. Hofmann, and I. Cartwright

Remediation and Control Technologies

1001  [dx.doi.org/10.1021/es302680c](https://doi.org/10.1021/es302680c)
Transformation and Removal of Tetrabromobisphenol A from Water in the Presence of Natural Organic Matter via Laccase-Catalyzed Reactions: Reaction Rates, Products, and Pathways
Yiping Feng, Lisa M. Colosi, Shixiang Gao, Qingguo Huang, and Liang Mao*

1009  [dx.doi.org/10.1021/es303503m](https://doi.org/10.1021/es303503m)
Enhancement of Arsenic Adsorption during Mineral Transformation from Siderite to Goethite: Mechanism and Application
Huaming Guo,* Yan Ren, Qiong Liu, Kai Zhao, and Yuan Li

1017  [dx.doi.org/10.1021/es303726h](https://doi.org/10.1021/es303726h)
The 4-*tert*-Butylphenol-Utilizing Bacterium *Sphingobium fuliginis* OMI Can Degrade Bisphenols via Phenolic Ring Hydroxylation and *Meta*-Cleavage Pathway
Yuka Ogata, Shohei Goda, Tadashi Toyama, Kazunari Sei, and Michihiko Ike*

1024  [dx.doi.org/10.1021/es303770c](https://doi.org/10.1021/es303770c)
Measurement and Modeling of Activated Carbon Performance for the Sequestration of Parent- and Alkylated-Polycyclic Aromatic Hydrocarbons in Petroleum-Impacted Sediments
Yongju Choi, Yeo-Myoung Cho, William R. Gala, and Richard G. Luthy*

1033  [dx.doi.org/10.1021/es304189t](https://doi.org/10.1021/es304189t)
Manipulation of Microbial Extracellular Electron Transfer by Changing Molecular Structure of Phenazine-Type Redox Mediators
Jie-Jie Chen, Wei Chen, Hui He, Dao-Bo Li, Wen-Wei Li, Lu Xiong, and Han-Qing Yu*

Sustainability Engineering and Green Chemistry

1040  [dx.doi.org/10.1021/es302886m](https://doi.org/10.1021/es302886m)
Potential Environmental Impacts from the Metals in Incandescent, Compact Fluorescent Lamp (CFL), and Light-Emitting Diode (LED) Bulbs
Seong-Rin Lim, Daniel Kang, Oladele A. Ogunseitan, and Julie M. Schoenung*

1048  [dx.doi.org/10.1021/es302960t](https://doi.org/10.1021/es302960t)
Study on Industrial Metabolism of Carbon in a Chinese Fine Chemical Industrial Park
Jinping Tian, Qiuping Guo, Ying Chen, Xing Li, Han Shi,* and Lujun Chen*

Ecotoxicology and Human Environmental Health

1057  [dx.doi.org/10.1021/es3040736](https://doi.org/10.1021/es3040736)
Stabilization of TiO₂ Nanoparticles in Complex Medium through a pH Adjustment Protocol
Camille Guiot and Olivier Spalla*

1065  [dx.doi.org/10.1021/es3045828](https://doi.org/10.1021/es3045828)
Effective Bacterial Inactivation and Removal of Copper by Porous Ceramics with High Surface Area
Tanja Yvonne Klein, Julia Wehling, Laura Treccani, and Kurosch Rezwan*

1073  [dx.doi.org/10.1021/es302633f](https://doi.org/10.1021/es302633f)
In Situ Metal Imaging and Zn Ligand-Speciation in a Soil-Dwelling Sentinel: Complementary Electron Microprobe and Synchrotron Microbeam X-ray Analyses
A. J. Morgan,* J. F. W. Mosselmans, J. M. Charnock, A. Bennett, C. Winters, M. O'Reilly, P. Fisher, J. Andre, M. Turner, P. Gunning, and P. Kille

1082  [dx.doi.org/10.1021/es302973y](https://doi.org/10.1021/es302973y)
Silver Nanoparticles Disrupt Wheat (*Triticum aestivum* L.) Growth in a Sand Matrix
Christian O. Dimkpa,* Joan E. McLean, Nicole Martineau, David W. Britt, Richard Haverkamp, and Anne J. Anderson


1091  [dx.doi.org/10.1021/es303170u](https://doi.org/10.1021/es303170u)
Application of a Label-free, Gel-free Quantitative Proteomics Method for Ecotoxicological Studies of Small Fish Species
K. J. Ralston-Hooper, M. E. Turner, E. J. Soderblom, D. Villeneuve, G. T. Ankley, M. A. Moseley, R. A. Hoke, and P. L. Ferguson*


1101  [dx.doi.org/10.1021/es303371t](https://doi.org/10.1021/es303371t)
Cancer Risk from Incidental Ingestion Exposures to PAHs Associated with Coal-Tar-Sealed Pavement
E. Spencer Williams,* Barbara J. Mahler, and Peter C. Van Metre

1110  [dx.doi.org/10.1021/es303505z](https://doi.org/10.1021/es303505z)
Predicting Fish Acute Toxicity Using a Fish Gill Cell Line-Based Toxicity Assay
Katrin Tanneberger, Melanie Knöbel, Frans J. M. Busser, Theo L. Sinnige, Joop L. M. Hermens, and Kristin Schirmer*

1120  [dx.doi.org/10.1021/es303522s](https://doi.org/10.1021/es303522s)
Risk of Arsenic Exposure from Drinking Water and Dietary Components: Implications for Risk Management in Rural Bengal
Dipti Halder,* Subhamoy Bhowmick, Ashis Biswas, Debashis Chatterjee, Jerome Nriagu, Debendra Nath Guha Mazumder, Zdenka Šlejkevce, Gunnar Jacks, and Prosun Bhattacharya


1128 [dx.doi.org/10.1021/es303577u](https://doi.org/10.1021/es303577u)
Pathogenic *Escherichia coli* Strains Producing Extended-Spectrum β -Lactamases in the Yeongsan River Basin of South Korea
Jeonghwan Jang, Yae-Seul Suh, Doris Y. W. Di, Tatsuya Unno, Michael J. Sadowsky, and Hor-Gil Hur*

1137  [dx.doi.org/10.1021/es303556n](https://doi.org/10.1021/es303556n)
Urinary Cadmium in the 1999–2008 U.S. National Health and Nutrition Examination Survey (NHANES)
Anne M. Riederer,* Anna Belova, Barbara J. George, and Paul T. Anastas

1148  [dx.doi.org/10.1021/es3036785](https://doi.org/10.1021/es3036785)
Toxicity of Quantum Dots and Cadmium Salt to *Caenorhabditis elegans* after Multigenerational Exposure
Elizabeth Q. Contreras, Minjung Cho, Huiguang Zhu, Hema L. Puppala, Gabriela Escalera, Weiwei Zhong,* and Vicki L. Colvin*

1155  [dx.doi.org/10.1021/es303983z](https://doi.org/10.1021/es303983z)
Genetic Variation in Parthenogenetic Collembolans Is Associated with Differences in Fitness and Cadmium-Induced Transcriptome Responses
Benjamin Nota,* Maarten de Korte, Bauke Ylstra, Nico M. van Straalen, and Dick Roelofs

Energy and the Environment

1163  [dx.doi.org/10.1021/es3025885](https://doi.org/10.1021/es3025885)
Toward the Understanding of Chemical Absorption Processes for Post-Combustion Capture of Carbon Dioxide: Electronic and Steric Considerations from the Kinetics of Reactions of CO₂(aq) with Sterically hindered Amines
William Conway,* Xiaoguang Wang, Debra Fernandes, Robert Burns, Geoffrey Lawrance, Graeme Puxty, and Marcel Maeder*

1170  [dx.doi.org/10.1021/es302959h](https://doi.org/10.1021/es302959h)
Spatially-Explicit Life Cycle Assessment of Sun-to-Wheels Transportation Pathways in the U.S.
Roland Geyer,* David Stoms, and James Kallaos

Correspondence

1177 [dx.doi.org/10.1021/es303575j](https://doi.org/10.1021/es303575j)
Comment on "Regulatory FOCUS Surface Water Models Fail to Predict Insecticide Concentrations in the Field"
Martin Bach* and John Hollis

1179 [dx.doi.org/10.1021/es3040957](https://doi.org/10.1021/es3040957)
Response to Comment on "Regulatory FOCUS Surface Water Models Fail to Predict Insecticide Concentrations in the Field"
Anja Knäbel,* Sebastian Stehle, Ralf B. Schäfer, and Ralf Schulz

 Supporting Information available via online article