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January 1, 2010

Volume 44, Issue 1

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About the Cover:

Cells in our body cull energy by dumping electrons onto O_2 molecules. Chemically, we *breathe* this *reducible gas* to *oxidize organic matter food* in our metabolic pathways. Yet O_2 is hardly the only ready recipient of electrons - many (micro)organisms breathe metals in their metabolism. Thus redox underpins how biology interacts with geology and is thus a vital mechanistic process in environmental chemistry. This Focus Issue on Biogeochemical Redox Processes sports a sampling of the important ongoing work in this vibrant scientific and engineering field. Cover photo of a subalpine beaver pond courtesy of Mark Dixon; microbe imagery courtesy of Oliver Meckes and Nicole Ottawa; cover concept by Darcy J. Gentleman. [View the article.](#)

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Biogeochemical Redox Processes

Comment

Biology meets geology through chemistry


Darcy J. Gentleman

pp 1-2

Publication Date (Web): December 30, 2009 [\(Comment\)](#)

DOI: 10.1021/es9036176

Abstract

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Guest Comment

How electron flow controls contaminant dynamics

Thomas Borch, Kate Campbell, Ruben Kretzschmar

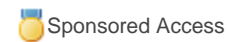
pp 3-6

Publication Date (Web): December 30, 2009 [\(Guest Comment\)](#)

DOI: 10.1021/es903264z

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Publication Date (Web): December 30, 2009 (Guest Comment)

DOI: 10.1021/es903552c

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Environmental News

From hospital to lab: tracing technetium

Naomi Lubick

p 8

Publication Date (Web): December 30, 2009 (Environmental News)

DOI: 10.1021/es903566f

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Rust-dissolving bugs may chow down with variety of utensils

Quinn Eastman

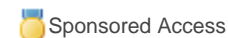
pp 9-10

Publication Date (Web): December 8, 2009 (Environmental News)

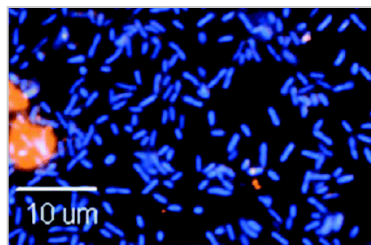
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Salmon as transport vectors for mercury

Charles Schmidt

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Mass extinction linked to lung cancer mystery

Janet Pelley

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Honolulu to implement cooling with deep-sea water

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Noreen Parks

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Critical Reviews

Biogeochemical Redox Processes and their Impact on Contaminant Dynamics

Thomas Borch, Ruben Kretzschmar, Andreas Kappler, Philippe Van Cappellen, Matthew Ginder-Vogel, Andreas Voegelin and Kate Campbell

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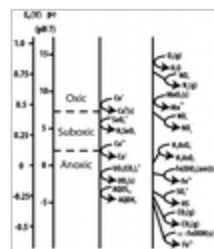


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Axel Heimann, Rasmus Jakobsen and Christian Blodau

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Claire E. Farnsworth and Janet G. Hering

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DOI: 10.1021/es901577q

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Claire E. Farnsworth, Sarah D. Griffis, Richard A. Wildman, Jr. and Janet G. Hering

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DOI: 10.1021/es901572h

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 Subscriber Access**Electrode-Based Approach for Monitoring In Situ Microbial Activity During Subsurface Bioremediation**

Kenneth H. Williams, Kelly P. Nevin, Ashley Franks, Andreas Englert, Philip E. Long and Derek R. Lovley

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 Subscriber Access**Redox Behavior of Magnetite: Implications for Contaminant Reduction**

Christopher A. Gorski, James T. Nurmi, Paul G. Tratnyek, Thomas B. Hofstetter and Michelle M. Scherer

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Anaerobic Fe(II)-Oxidizing Bacteria Show As Resistance and Immobilize As during Fe(III) Mineral Precipitation

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Redox Transformation of Arsenic by Fe(II)-Activated Goethite (α -FeOOH)

Katja Amstaetter, Thomas Borch, Philip Larese-Casanova and Andreas Kappler

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Evidence for Different Surface Speciation of Arsenite and Arsenate on Green Rust: An EXAFS and XANES Study

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

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Temperature Dependence and Coupling of Iron and Arsenic Reduction and Release during Flooding of a Contaminated Soil

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Dissolved Organic Matter Sources and Consequences for Iron and Arsenic Mobilization in Bangladesh Aquifers

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Kinetics of Chromium(III) Oxidation by Manganese(IV) Oxides Using Quick Scanning X-ray Absorption Fine Structure Spectroscopy (Q-XAFS)




Gautier Landrot, Matthew Ginder-Vogel and Donald L. Sparks

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Role of Nitrate in Conditioning Aquifer Sediments for Technetium Bioreduction

Gareth T. W. Law, Andrea Geissler, Christopher Boothman, Ian T. Burke, Francis R. Livens, Jonathan R. Lloyd and Katherine Morris

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Kinetic and Mechanistic Constraints on the Oxidation of Biogenic Uraninite by Ferrihydrite

Matthew Ginder-Vogel, Brandy Stewart and Scott Fendorf

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Influence of Dynamical Conditions on the Reduction of U^{VI} at the Magnetite–Solution Interface

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Bioreduction of Nitrobenzene, Natural Organic Matter, and Hematite by *Shewanella putrefaciens* CN32

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Non-Steady State Modeling of Arsenic Diagenesis in Lake Sediments

Raoul-Marie Couture, Babak Shafei, Philippe Van Cappellen, André Tessier and Charles Gobeil

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Policy Analysis

Spatial- and Time-Explicit Human Damage Modeling of Ozone Depleting Substances in Life Cycle Impact Assessment

Jaap Struijs, Arjan van Dijk, Harry Slaper, Harm J. van Wijnen, Guus J. M. Velders, George Chaplin and Mark A.

J. Huijbregts

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Characterization of Natural and Affected Environments

Exposures to Particulate Air Pollution and Nitro-Polycyclic Aromatic Hydrocarbons among Taxi Drivers in Shenyang, China

Justin P. Miller-Schulze, Michael Paulsen, Akira Toriba, Ning Tang, Kazuichi Hayakawa, Kenji Tamura, Lijun Dong, Xuemei Zhang and Christopher D. Simpson

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Air Toxic Emissions from Snowmobiles in Yellowstone National Park

Yong Zhou, David Shively, Huiting Mao, Rachel S. Russo, Bruce Pape, Richard N. Mower, Robert Talbot and Barkley C. Sive

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Nicholas C. Surawski, Branka Miljevic, Boyd A. Roberts, Robin L. Modini, Rong Situ, Richard J. Brown, Steven E. Bottle and Zoran D. Ristovski

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Shelly D. Kelly, Wei-Min Wu, Fan Yang, Craig S. Criddle, Terence L. Marsh, Edward J. O'Loughlin, Bruce Ravel, David Watson, Philip M. Jardine and Kenneth M. Kemner

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Characterizing Pb Mobilization from Upland Soils to Streams Using $^{206}\text{Pb}/^{207}\text{Pb}$ Isotopic Ratios





Julian J. C. Dawson, Doerthe Tetzlaff, Anne-Marie Carey, Andrea Raab, Chris Soulsby, Kenneth Killham and Andrew A. Meharg

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Unimolecular β -Hydroxyperoxy Radical Decomposition with OH Recycling in the Photochemical Oxidation of Isoprene





Gabriel da Silva, Claire Graham and Zhe-Fei Wang

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Gas-Particle Partitioning of Alcohol Vapors on Organic Aerosols





Lap P. Chan, Alex K. Y. Lee and Chak K. Chan

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Zhaohui Wang, Xi Chen, Hongwei Ji, Wanhong Ma, Chuncheng Chen and Jincai Zhao

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Pressure Monitoring and Characterization of External Sources of Contamination at the Site of the Payment Drinking Water Epidemiological Studies

Marie-Claude Besner, Romain Broséus, Jean Lavoie, George Di Giovanni, Pierre Payment and Michèle Prévost

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Substantial Emission of Gaseous Monomethylmercury from Contaminated Water–Sediment Microcosms

Sofi Jonsson, Ulf Skjällberg and Erik Björn

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Nitration Processes of Acetaminophen in Nitrifying Activated Sludge

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Eunhyea Chung, Hyojin Kweon, Sotira Yiacoymi, Ida Lee, David C. Joy, Anthony V. Palumbo and Costas Tsouris

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Using a Novel Petroselinic Acid Embedded Cellulose Acetate Membrane to Mimic Plant Partitioning and In Vivo Uptake of Polycyclic Aromatic Hydrocarbons

Xiuying Li, Yanhong Zhu, Tong Wu, Shuzhen Zhang and Peter Christie

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Formation and Stability of Ni–Al Hydroxide Phases in Soils

Edward Peltier, Daniel van der Lelie and Donald L. Sparks

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Evaluation of the Effects of Low Oxygen Concentration on Stable Isotope Fractionation during Aerobic MTBE Biodegradation

Mònica Rosell, Stefanie Finsterbusch, Sven Jechalke, Thomas Hübbschmann, Carsten Vogt and Hans H. Richnow

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Increasing Contaminant Burdens in an Arctic Fish, Burbot (*Lota lota*), in a Warming Climate

J. Carrie, F. Wang, H. Sanei, R. W. Macdonald, P. M. Outridge and G. A. Stern

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Comparison of Earthworm Bioaccumulation between Readily Desorbable and Desorption-Resistant Naphthalene: Implications for Biouptake Routes




Yachao Qi and Wei Chen

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Development of Resource Shed Delineation in Aquatic Ecosystems

David F. Raikow, Joseph F. Atkinson and Thomas E. Croley II

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Operational Boundaries for Nitrite Accumulation in Nitrification Based on Minimum/Maximum Substrate Concentrations That Include Effects of Oxygen Limitation, pH, and Free Ammonia and Free Nitrous Acid Inhibition

Seongjun Park, Wookeun Bae and Bruce E. Rittmann

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Ozone and TFA Impacts in North America from Degradation of 2,3,3,3-Tetrafluoropropene (HFO-1234yf), A Potential Greenhouse Gas Replacement

Deborah J. Luecken, Robert L. Waterland, Stella Papasavva, Kristen N. Taddonio, William T. Hutzell, John P.

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Dissolution Potential of SO₂ Co-Injected with CO₂ in Geologic Sequestration

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Lauren E. Crandell, Brian R. Ellis and Catherine A. Peters

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Seasonal PCB Bioaccumulation in an Arctic Marine Ecosystem: A Model Analysis Incorporating Lipid Dynamics, Food-Web Productivity and Migration

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Frederik De Laender, Dick Van Oevelen, Sylvia Frantzen, Jack J. Middelburg and Karline Soetaert

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Environmental Measurements Methods

Calibration of Silicone Rubber Passive Samplers: Experimental and Modeled Relations between Sampling Rate and Compound Properties

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Tatsiana P. Rusina, Foppe Smedes, Martina Koblizkova and Jana Klanova

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New Approaches to Performance Testing of Improved Cookstoves





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Evaluation of the OECD 314B Activated Sludge Die-Away Test for Assessing the Biodegradation of Pharmaceuticals

Jon F. Ericson

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Quantitative and Qualitative Trapping of Volatile Methylated Selenium Species Entrained through Nitric Acid

Lenny Winkel, Joerg Feldmann and Andrew A. Meharg

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Vapor Pressure Measurements on Low-Volatility Terpenoid Compounds by the Concatenated Gas Saturation Method

Jason A. Widegren and Thomas J. Bruno

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PCDD/F, PBDD/F, and PBDE Emissions from Open Burning of a Residential Waste Dump

Brian K. Gullett, Barbara Wyrzykowska, Emanuela Grandesso, Abderrahmane Touati, Dennis G. Tabor and





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Gustavo Solórzano Ochoa

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Remediation and Control Technologies

Remediation of Chromium(VI) by a Methane-Oxidizing Bacterium

Abubakr Al Hasin, Stephen J. Gurman, Loretta M. Murphy, Ashlee Perry, Thomas J. Smith and Philip H. E.





Gardiner

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Aqueous Carbonation of Natural Brucite: Relevance to CO₂ Sequestration





Liang Zhao, Liqin Sang, Jun Chen, Junfeng Ji and H. Henry Teng

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Characterization of the Mineral Fraction Associated to Extracellular Polymeric Substances (EPS) in Anaerobic Granular Sludges





Paul d'Abzac, François Bordas, Emmanuel Joussein, Eric van Hullebusch, Piet N. L. Lens and Gilles Guibaud

pp 412-418

Publication Date (Web): December 1, 2009 (Article)

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Directed Synthesis of Mesoporous TiO₂ Microspheres: Catalysts and Their Photocatalysis

for Bisphenol A Degradation





Changsheng Guo, Ming Ge, Lu Liu, Guandao Gao, Yinchang Feng and Yuqiu Wang

pp 419-425

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DOI: 10.1021/es9019854

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Catalytic Oxidation of Elemental Mercury over the Modified Catalyst Mn/ α -Al₂O₃ at Lower

Temperatures





Jianfeng Li, Naiqiang Yan, Zan Qu, Shaohua Qiao, Shijian Yang, Yongfu Guo, Ping Liu and Jinping Jia

pp 426-431

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Sonochemical Degradation of Perfluorooctanesulfonate in Aqueous Film-Forming Foams





Chad D. Vecitis, Yajuan Wang, Jie Cheng, Hyunwoong Park, Brian T. Mader and Michael R. Hoffmann

pp 432-438

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Transformation of Bromine Species in TiO₂ Photocatalytic System





Xiwang Zhang, Tong Zhang, Jiawei Ng, Jia Hong Pan and Darren Delai Sun

pp 439-444

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Sonochemical Degradation of Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoate

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(PFOA) in Groundwater: Kinetic Effects of Matrix Inorganics

Jie Cheng, Chad D. Vecitis, Hyunwoong Park, Brian T. Mader and Michael R. Hoffmann

pp 445-450

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Structuring a TiO₂-Based Photonic Crystal Photocatalyst with Schottky Junction for Efficient

Photocatalysis





Huan Chen, Shuo Chen, Xie Quan and Yaobin Zhang

pp 451-455

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Bioleaching of Ultramafic Tailings by *Acidithiobacillus* spp. for CO₂ Sequestration





Ian M. Power, Gregory M. Dipple and Gordon Southam

pp 456-462

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Wood Plastic Composite Produced by Nonmetals from Pulverized Waste Printed Circuit Boards





Jie Guo, Yinen Tang and Zhenming Xu

pp 463-468

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Serial Analysis of Gene Expression in the Skeletal Muscles of Zebrafish Fed with a Methylmercury-Contaminated Diet





Sébastien Cambier, Patrice Gonzalez, Gilles Durrieu, Régine Maury-Brachet, Alain Boudou and Jean-Paul Bourdineaud

pp 469-475

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Concentration Response Functions for Ultrafine Particles and All-Cause Mortality and Hospital Admissions: Results of a European Expert Panel Elicitation





Gerard Hoek, Hanna Boogaard, Anne Knol, Jeroen de Hartog, Pauline Slottje, Jon G. Ayres, Paul Borm, Bert Brunekreef, Ken Donaldson, Francesco Forastiere, Stephen Holgate, Wolfgang G. Kreyling, Benoit Nemery, Juha Pekkanen, Vicki Stone, H.-Erich Wichmann and Jeroen van der Sluijs

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Pyrethroid and Organophosphorus Pesticides in Composite Diet Samples from Atlanta, USA Adults





Anne M. Riederer, Ronald E. Hunter Jr., Steven W. Hayden and P. Barry Ryan

pp 483-490

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Sex Differences in the Uptake and Disposition of Perfluorooctanoic Acid in Fathead Minnows after Oral Dosing

Jonathan J. Lee and Irvin R. Schultz

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Recombinant Albumin and Transthyretin Transport Proteins from Two Gull Species and Human: Chlorinated and Brominated Contaminant Binding and Thyroid Hormones

Francisco Uceda-Marín, Augustine Arukwe, Anne S. Mortensen, Geir W. Gabrielsen and Robert J. Letcher

pp 497-504

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Chemical Characterization of Emissions from Modern Two-Stroke Mopeds Complying with Legislative Regulation in Europe (EURO-2)

T. Adam, A. Farfaletti, L. Montero, G. Martini, U. Manfredi, B. Larsen, G. De Santi, A. Krasenbrink and C. Astorga

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Bioelectrochemical Ethanol Production through Mediated Acetate Reduction by Mixed Cultures

Kirsten J. J. Steinbusch, Hubertus V. M. Hamelers, Joris D. Schaap, Christel Kampman and Cees J. N. Buisman

pp 513-517

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Anodophilic Biofilm Catalyzes Cathodic Oxygen Reduction





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Ka Yu Cheng, Goen Ho and Ralf Cord-Ruwisch

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Corona Ions from Overhead Transmission Voltage Powerlines: Effect on Direct Current Electric Field and Ambient Particle Concentration Levels





Folasade J-Fatokun, Rohan Jayaratne, Lidia Morawska, David Birtwhistle, Rihandanu Rachman and Kerrie Mengersen

pp 526-531

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Solar Energy Powered Microbial Fuel Cell with a Reversible Bioelectrode





David P.B.T.B. Strik, Hubertus V.M. Hamelers and Cees J.N. Buisman

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Life Cycle Emissions and Cost of Producing Electricity from Coal, Natural Gas, and Wood Pellets in Ontario, Canada





Yimin Zhang, Jon McKechnie, Denis Cormier, Robert Lyng, Warren Mabee, Akifumi Ogino and Heather L. MacLean

pp 538-544

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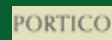
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