

SYMPOSIUM G

SESSION G2: Hydrogen Economy
Chair: Vasilis Fthenakis
Monday Afternoon, November 28, 2005
Room 303 (Hynes)

Life-Cycle Analysis Tools for "Green" Materials and
Process Selection

November 28 - 30, 2005

Chairs

Stella Papasavva GM R&D Center
Vasilis Fthenakis US DOE EH&S Research Center
Steven J. Skerlos University of Michigan-Ann Arbor

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* Invited paper

SESSION G1/S1: Joint Session: LCA Principles
Chair: Stella Papasavva
Monday Morning, November 28, 2005
Room 203 (Hynes)

8:30 AM *G1.1/S1.1

Integration and application of Life Cycle Assessment within the design of products and processes - an important step towards sustainable development Marc Binder and Harald Florin; PE Europe GmbH, Leinfelden-Echterdingen, Germany.

9:00 AM *G1.2/S1.2

A Sequential Interindustry Model as an LCA Tool. Stephen H. Levine¹ and Thomas P. Gloria²; ¹Civil and Environmental Engineering, Tufts University, Medford, Massachusetts; ²Five Winds International, Newton, Massachusetts.

9:30 AM *G1.3/S1.3

The use of Life Cycle Engineering/ Life Cycle Assessment within the design process of production facilities; A business case: Different options of handling overspray Marc Binder, Johannes Kreissig and Harald Florin; PE Europe GmbH, Leinfelden-Echterdingen, Germany.

10:00 AM BREAK

10:30 AM *G1.4/S1.4

Environmental Assessment of Micro/Nano Production in a Life Cycle Perspective. Stig Irving Olsen, Dep. Manufacturing Engineering and Management, Technical University of Denmark, Lyngby, Denmark.

11:00 AM *G1.5/S1.5

Energy and the Environment: Perpetual Dilemma or Nanotechnology-Enabled Opportunity? Debra R. Rolison and Jeffrey W. Long; Surface Chemistry, Naval Research Laboratory, Washington, District of Columbia.

11:30 AM G1.6/S1.6

Input/Output-But What Does It Really Mean? Mark Goedkoop² and Lise Laurin^{1,3}; ¹EarthShift, Eliot, Maine; ²PRE Consultants, bv, Amersfoort, Netherlands; ³Sylvatica, North Berwick, Maine.

11:45 AM G1.7/S1.7

Addressing Environmental Issues for the Automotive Industry Stella Papasavva, ¹Chemical & Environmental Sciences Lab, General Motors, Warren, Michigan; ²General Motors, Warren, Michigan.

1:30 PM *G2.1

Implementing a Hydrogen Energy Infrastructure: Materials Issues and System Design. Joan Ogden, Institute of Transportation Studies, University of California-Davis, Davis, California.

2:00 PM *G2.2

Hydrogen as Fuel for Urban Transportation. Environmental Footprint of Different Hydrogen Production Routes and the Influence on the Total Life Cycle of FC Powered Transportation Systems: An LCA Case Study within CUTE. Marc Binder¹, Michael Faltenbacher² and Matthias Fischer²; ¹PE Europe GmbH, Leinfelden-Echterdingen, Germany; ²Life Cycle Engineering, IKP University of Stuttgart, Stuttgart, Germany.

2:30 PM BREAK

3:30 PM *G2.3

Well-to-Wheels Analysis of Advanced Fuel/Vehicle Systems - A North American Study of Energy Use, Greenhouse Gas Emissions, and Criteria Emissions. Michael Wang¹ and Norman D. Brinkman²; ¹Center for Transportation Research, Argonne National Laboratory, Argonne, Illinois; ²R&D Center, General Motors, Warren, Michigan.

4:00 PM G2.4

A Life Cycle Analysis of Hydrogen Production for Buildings and Vehicles. Kendra Tupper and Jan F. Kreider; Civil, Environmental, and Architectural Engineering, University of Colorado, Boulder, Boulder, Colorado.

4:15 PM *G2.5

Life Cycle Assessment of Alternative Fuels for Light-Duty Vehicles: Assessing the Potential of Biomass Derived Alternatives. Heather L. MacLean, Sabrina Spatari and Jesse S. Fleming; Civil Engineering, University of Toronto, Toronto, Ontario, Canada.

SESSION G3: Photovoltaics

Chair: Vasilis Fthenakis
Tuesday Morning, November 29, 2005
Room 303 (Hynes)

8:30 AM *G3.1

LCA-based evaluation of ecological impacts and external costs of current and new electricity and heating systems Roberto Dones and Thomas Heck; Paul Scherrer Institut, Villigen PSI, Switzerland.

9:00 AM *G3.2

The Importance of Balance of System in LCA of Photovoltaic Systems, Present Status and Future Implications. Paolo Frankl, Ecobilancio Italia, Rome, Italy.

9:30 AM G3.3

Life Cycle Greenhouse Gas emissions from the Nuclear and Photovoltaic Fuel Cycle. Vasilis Fthenakis and Hyung Chul Kim; National Photovoltaic EH&S Research Center, Brookhaven National Laboratory, Upton, New York.

9:45 AM G3.4

Environmental Life Cycle Inventory of Crystalline Silicon Photovoltaic Module Production. Mariska de Wild-Scholten¹ and Erik Alsema²; ¹Solar Energy, Energy Research Centre of the Netherlands, Petten, Netherlands; ²Copernicus Institute, Utrecht University, Utrecht, Netherlands.

10:00 AM BREAK

10:30 AM *G3.5

Environmental Impact of Crystalline Silicon Photovoltaic Module Production Erik Alsema¹ and Mariska J. de Wild-Scholten²; ¹Science, Technology and Society, Copernicus Institute, Utrecht University, Utrecht, Netherlands; ²Unit Solar Energy, Energy research Centre of the Netherlands ECN, Petten, Netherlands.

11:00 AM G3.6

Life Cycle Energy Use and Greenhouse Gas Emissions Embedded in Electricity Generated by Thin Film CdTe

Photovoltaics. Hyung Chul Kim and Vasilis Fthenakis; National Photovoltaic EH&S Research Center, Brookhaven National Laboratory, Upton, New York.

11:15 AM G3.7

Life Cycle Analysis of Solar Module Recycling Process. Karsten Wambach¹, Anja Mueller¹ and Erik Alsema²; ¹Deutsche Solar AG, Solar Material, Freiberg, Germany; ²Department of Science, Technology and Society, Copernicus Institute, Utrecht, Netherlands.

SESSION G4/S4: Joint Session: Nanomaterials:
Biological and Environmental Interactions
Chair: Vicki Stone
Tuesday Afternoon, November 29, 2005
Room 203 (Hynes)

1:30 PM *G4.1/S4.1

Toxicological Profiles of Nanomaterials. Erik Rushton, Gunter Oberdorster and Jacob Finkelstein; University of Rochester, Rochester, New York.

2:00 PM *G4.2/S4.2

Pulmonary Effects in Rats of Exposure to Nanoscale Titanium Dioxide or Nanoscale Quartz Particles: Particle Size and Surface Area are not the Only Considerations. David B. Warheit¹, Kenneth L. Reed¹, Thomas R. Webb¹, Christie M. Sayes² and Vicki L. Colvin²; ¹DuPont Haskell Laboratory, Newark, Delaware; ²Rice University, Houston, Texas.

2:30 PM BREAK

3:30 PM *G4.3/S4.3

Suggested Strategies for the Ecotoxicology Testing of New Nanomaterials. Vicki Stone, A. Ford and T. Fernandes; School of Life Sciences, Napier University, Edinburgh, United Kingdom.

4:00 PM *G4.4/S4.4

Case Studies for Environmentally-Conscious Materials Selection with the CES Eco-Selector Ulrike G.K. Wegst¹ and Michael F. Ashby²; ¹Max-Planck-Institute for Metals Research, Stuttgart, Germany; ²Cambridge University Engineering Department, Cambridge, United Kingdom.

4:30 PM G4.5/S4.5

Atomic force microscopy of CHO cells exposed to quantum dots Minhua Zhao¹, Charudharshini Srinivasan², Jeunghoon Lee¹, Diane Burgess², Fotios Papadimitrakopoulos¹ and Bryan D. Huey¹; ¹Institute of Materials Science, University of Connecticut, Storrs, Connecticut; ²School of Pharmacy, University of Connecticut, Storrs, Connecticut.

4:45 PM G4.6/S4.6

Characterization, Imaging and Degradation Studies of Quantum Dots in Aquatic Organisms. Kenneth E. Gonsalves¹, Sireesha Khambhammettu¹ and Amy H. Ringwood²; ¹Chemistry, University of North Carolina at Charlotte, Charlotte, North Carolina; ²Biology, University of North Carolina at Charlotte, Charlotte, North Carolina.

SESSION G5: Global Warming and End-of-Life Case Studies
Chair: Stella Papasavva
Wednesday Morning, November 30, 2005
Room 303 (Hynes)

8:30 AM G5.1

The Effect of Emissions from Fossil Fuel Combustion on Global Climate Change. Kristy E. Ross^{1,2} and Stuart J. Piketh¹; ¹Climatology Research Group, University of the Witwatersrand, Johannesburg, South Africa; ²Eskom TSI, Johannesburg, South Africa.

8:45 AM G5.2

The Global Warming Effect of Dams Decommissioning: A Life Cycle Perspective Sergio Pacca, Center for Sustainable Systems, University of Michigan, Ann Arbor, Michigan.

9:00 AM *G5.3

Grand Challenge of Vehicular Hydrogen Storage: Developing an Appropriate Adsorption System. Anne C. Dillon, Y. Zhao, J.

L. Blackburn, P. A. Parilla, Y.-H. Kim, S. B. Zhang, C. Curtis, T. Gennett, J. L. Alleman, K. M. Jones and M. J. Heben; Basic Science Department, National Renewable Energy Laboratory, Golden, Colorado.

9:30 AM *G5.4

A Life Cycle Model to Assess End of Life Vehicle Treatment Options. Candace Sue Wheeler^{1,2}, Nakia L. Simon^{3,2}, Claudia M. Duranceau^{4,2} and Gerald R. Winslow^{5,2}; ¹Chemical and Environmental Sciences Laboratory, General Motors, Warren, Michigan; ²Vehicle Recycling Partnership, USCAR, Southfield, Michigan; ³DaimlerChrysler, Auburn Hills, Michigan; ⁴Ford Motor Company, Dearborn, Michigan; ⁵KBS Consulting, Auburn Hills, Michigan.

10:00 AM BREAK

10:30 AM G5.5

Grinding and Separation of The Cellular Phone Housing. Woo-Hyuk Jung^{1,2}, Nathan Tortorella², Charles L. Beatty² and Stephen P. McCarthy¹; ¹Plastics Engineering Department, University of Massachusetts Lowell, Lowell, Massachusetts; ²Materials Science and Engineering Department, University of Florida, Gainesville, Florida.

10:45 AM G5.6

Preparation of Recycled Polycarbonate/Acrylonitrile-Butadiene-Styrene Composites. Woo-Hyuk Jung^{1,2}, Nathan Tortorella², Charles L. Beatty² and Stephen P. McCarthy¹; ¹Plastics Engineering Department, University of Massachusetts Lowell, Lowell, Massachusetts; ²Materials Science and Engineering Department, University of Florida, Gainesville, Florida.

11:00 AM G5.7

Life Cycle Assessment (LCA) and Biodegradability of Biobased Composites. Salil Arora¹, Satish Joshi^{3,1}, Manjuri Misra¹, Amar K. Mohanty^{2,1} and Lawrence T. Drzal¹; ¹Composite Materials and Structures Center, Department of Chemical Engineering and Materials Science, Michigan State University, East Lansing, Michigan; ²School of Packaging, Michigan State University, East Lansing, Michigan; ³Department of Agricultural Economics, Michigan State University, East Lansing, Michigan.

SESSION G6: LCA Tools and Case Studies
Chair: Vasilis Fthenakis
Wednesday Afternoon, November 30, 2005
Room 303 (Hynes)

1:30 PM *G6.1

Guiding the design and application of new materials for enhancing sustainability performance Gregory A. Keoleian¹, Alissa Kendall¹, Michael D. Lepech² and Victor C. Li²; ¹Center for Sustainable Systems, University of Michigan, Ann Arbor, Michigan; ²Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, Michigan.

2:00 PM G6.2

Strength life cycle analysis of mortars and its environmental impact Antonia Moropoulou¹, Christopher Koroneos², Maria Karoglou¹, Eleni Aggelakopoulou¹ and Kyriakos Labropoulos¹; ¹School of Chemical Engineering, National Technical University of Athens, Athens, Greece; ²Laboratory of Heat Transfer and Environmental Engineering, Aristotle University of Thessaloniki, Thessaloniki, Greece.

2:15 PM G6.3

Life cycle assessment of softdrink delivery systems Dario Martino¹, Amar Mohanty¹, Susan Selke¹ and Satish Joshi²; ¹School of Packaging, Michigan State University, East Lansing, Michigan; ²Department of Agricultural Economics, Michigan State University, East Lansing, Michigan.

2:30 PM BREAK

3:30 PM G6.4

Development of an Efficient LCA Communication Tool for DfE. Harald Florin¹, Michael Betz¹, Thorsten Volz¹ and Nuno da Silva²; ¹PE Europe GmbH, Leinfelden-Echterdingen, Germany; ²Unilever, Colworth, United Kingdom.

3:45 PM G6.5

A Hybrid Environmental Life Cycle Assessment of a CMOS

Device. Sarah B. Boyd^{1,2}, Nikhil Krishnan^{3,1,2} and Sebastien Raoux²; ¹Mechanical Engineering, University of California, Berkeley, Berkeley, California; ²Capital Assets Management, Applied Materials, Santa Clara, California; ³Earth Institute, Columbia University, New York, New York.

4:00 PM G6.6

Practical LCA for Small and Medium-Sized Enterprises.

Lise Laurin^{1,2}, Gregory A. Norris² and Mark Goedkoop³;
¹EarthShift, Eliot, Maine; ²Sylvatica, North Berwick, Maine; ³PRe Consultants, Amersfoort, Netherlands.