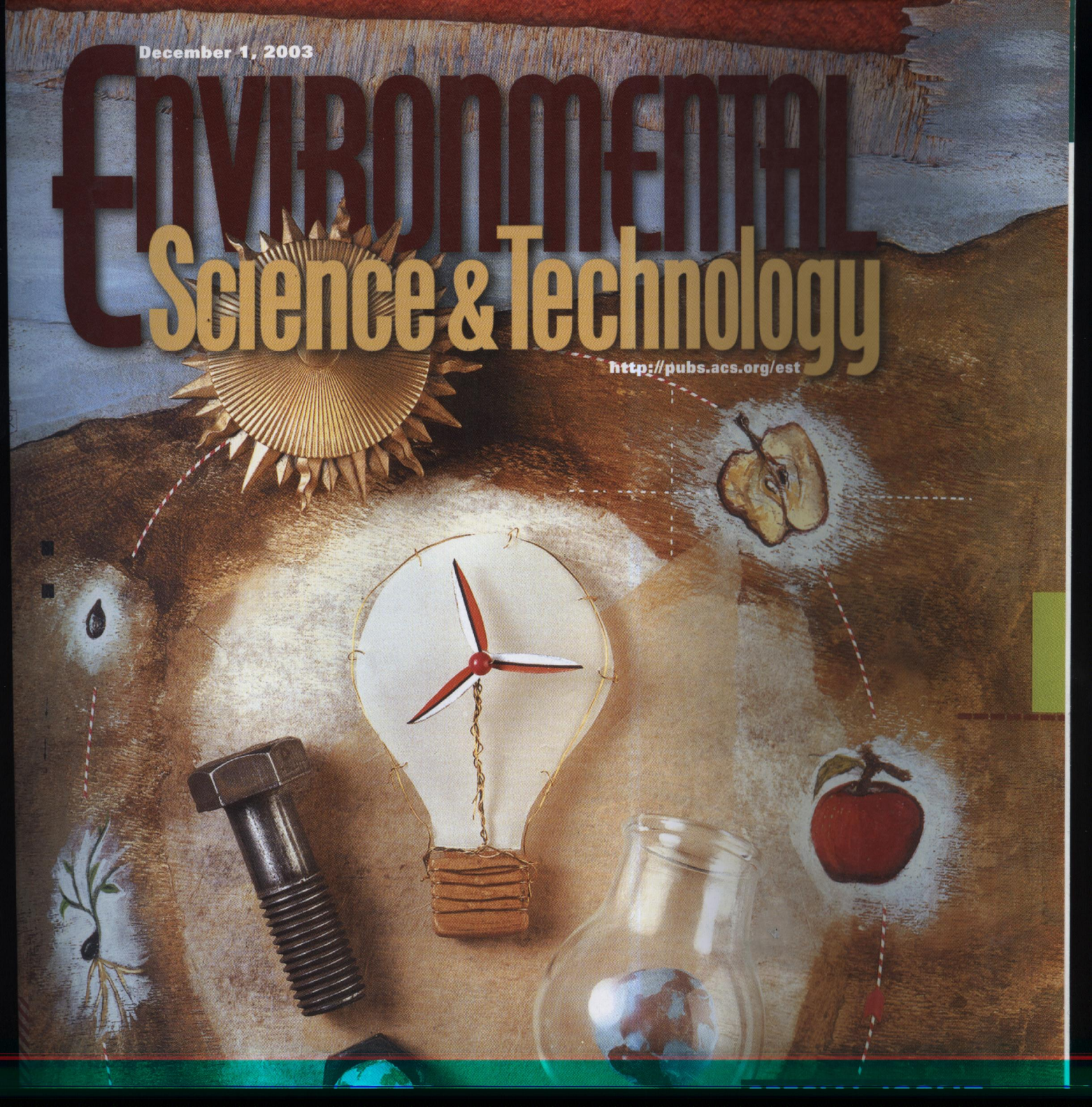


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Sustainability Engineering and Green Chemistry

5269

EcoWorx, Green Engineering Principles in Practice

Jeffery W. Segars, Steven L. Bradfield, Jeffery J. Wright, and Matthew J. Reaiff

Green engineering and cradle-to-cradle design principles are used to evaluate the environmental, qualitative, and economic performance of a recyclable carpet tile product.

5278

Design of Hard-Water Stable Emulsifier Systems for Petroleum- and Bio-based Semi-synthetic Metalworking Fluids

Julie B. Zimmerman, Andres F. Clarens, Kim F. Hayes, and Steven J. Skerlos

Novel mineral oil and vegetable oil metalworking fluids (MWFs) are developed and exhibit competitive performance and improved stability under hard-water conditions relative to commercially available MWFs.

5289

Oxidation Reactions in CO₂: Academic Exercise or Future Green Processes?

E. J. Beckman

With a focus on larger-scale commodity processes, situations are examined in which CO₂ could provide both process and green advantages if used strategically.

5297

Product Self-Management: Evolution in Recycling and Reuse

Valerie M. Thomas

The potential for product self-management to enhance recycling and reuse is explored through a technological assessment of product identification and an economic model of product reuse.

5303

Multi-Criteria Decision Making for Optimization of Product Disassembly under Multiple Situations

Aaron Hula, Kiumars Jalali, Karim Hamza, Steven J. Skerlos, and Kazuhiro Saitou

A multi-objective genetic algorithm-based methodology is developed to rapidly approximate the Pareto set of optimal end-of-life trade-offs between cost and environmentally conscious actions.

5325

Green Chemical Engineering Aspects of Reactive Distillation

Michael F. Malone, Robert S. Huss, and Michael F. Doherty

Reactive or catalytic distillation technology provides greener chemical production by reducing byproducts, energy, and process complexity, but not without some investment in engineering.

5330

Designing Resilient, Sustainable Systems

Joseph Fiksel

Industrial enterprises can both contribute to global sustainable development and enhance the sustainability of their own businesses by designing systems that are inherently resilient.

5340

Industrial Applications Using BASF Eco-Efficiency Analysis: Perspectives on Green Engineering Principles

David R. Shonnard, Andreas Kicherer, and Peter Saling

Eco-efficiency analysis, an important strategy and success factor in sustainable development, is a very strong operational tool at BASF.

5349

Promoting Green Engineering through Green Chemistry

Mary M. Kirchhoff

The need for engineering safeguards is minimized when green chemistry principles are incorporated into feedstock and reagent selection, solvent use, and overall synthetic design.

5354

Disassembly Factories for Electrical and Electronic Products To Recover Resources in Product and Material Cycles

Bahadır Basdere and Guenther Seliger

Tool concepts with as many standardized modules as possible, and as few application-specific elements as necessary, save in setup and investment costs.

5363

Road Map and Principles for Built Environment Sustainability

Jorge A. Vanegas

Achieving built environment sustainability requires that all decision-makers integrate sustainability in any of its multiple manifestations (formally, explicitly, systemically, and systematically).

5373

5383

Research Issues in Sustainable Consumption: Toward an Analytical Framework for Materials and the Environment

Valerie M. Thomas and T. E. Graedel

Key research questions of analytical support for green engineering and environmental policy, as well as the dynamics of technology, economics, and environmental impacts, are defined.

5389

Constrained Optimization for Green Engineering Decision Making

Deborah L. Thurston and Suresh Srinivasan

Mathematical modeling provides a transparent framework whereby environmental impacts are treated not as an afterthought but rather as a worthy component of the analytic effort.

5398

Development of Service-Oriented Products Based on the Inverse Manufacturing Concept

Jun Fujimoto, Yasushi Umeda, Tetsuya Tamura, Tetsuo Tomiyama, and Fumihiko Kimura

Advantages of and issues related to product "servicification" and prototype development of service-oriented products are discussed.

■ 5407

Life Cycle Optimization of Automobile Replacement: Model and Application

Hyung Chul Kim, Gregory A. Keoleian, Darby E. Grande, and James C. Bean

A life cycle optimization model integrating life cycle assessment and dynamic programming is developed to determine optimal lifetimes for mid-sized automobiles based on energy and environmental objectives.

5414

Global Sustainability and Key Needs in Future Automotive Design

John W. McAuley

Current automotive trends threaten vehicle environmental sustainability unless vehicle designs are developed that incorporate advanced lightweight materials, alternative engine technologies, and improved environmental performance.

5417

A Symbolic Methodology To Improve Disassembly Process Design

Pedro Rios, Leslie Blyler, Lisa Tieman, Julie Ann Stuart, and Ed Grant

Design symbols that signal product complexity with respect to location and number of fasteners for efficient separation of plastic housings for plastics recycling are introduced.

5424

Hydroformylation of 1-Hexene in Supercritical Carbon Dioxide: Characterization, Activity, and Regioselectivity Studies

Anne E. Marteel, Timothy T. Tack, Selma Bektesevic, Julian A. Davies, Mark R. Mason, and Martin A. Abraham

Hydroformylation of 1-hexene using platinum or rhodium complex catalysts tethered to controlled pore size MCM-type supports demonstrate improved regioselectivity during reactions in supercritical CO₂.

5432

Greener by Design

Urmila M. Diwekar

An integrated framework, whose core is an efficient algorithm for multi-objective optimization under uncertainty, starts with chemical and material selection and includes management and planning decisions.

5445

Life Cycle Assessment of Automobile/Fuel Options

Heather L. MacLean and Lester B. Lave

Although no alternative fuel or propulsion system automobile fulfills all goals concerning pollution, safety, sustainability, and cost, when evaluated according to lifecycle assessment and sustainability principles, some progress is evident.

5453

Green Engineering Education through a U.S. EPA/Academia Collaboration

David R. Shonnard, David T. Allen, Nhan Nguyen, Sharon Weil Austin, and Robert Hesketh

The key elements in green engineering education that enlarge the "box" for engineering design are environmental literacy, environmentally conscious design, and beyond-the-plant boundary considerations.

■ 5463

Plastics Disassembly versus Bulk Recycling: Engineering Design for End-of-Life Electronics Resource Recovery

Pedro Rios, Julie Ann Stuart, and Ed Grant

Discrete event simulation is used to compare current mixed plastics recovery with spectrochemical plastic resin identification and subsequent sorting.

■ Supporting Information is available free of charge via the Internet at <http://pubs.acs.org>.