

White Book and Symposium-in-Print on Green Chemistry

Poster presented at the
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Special Topic Issue on Green Chemistry

Pure and Applied Chemistry 72(7) (2000)

Publication Objective

✓ To promote and disseminate awareness throughout the academic and industrial scientific research community for environmentally compatible synthetic pathways and chemical processes (green chemistry).

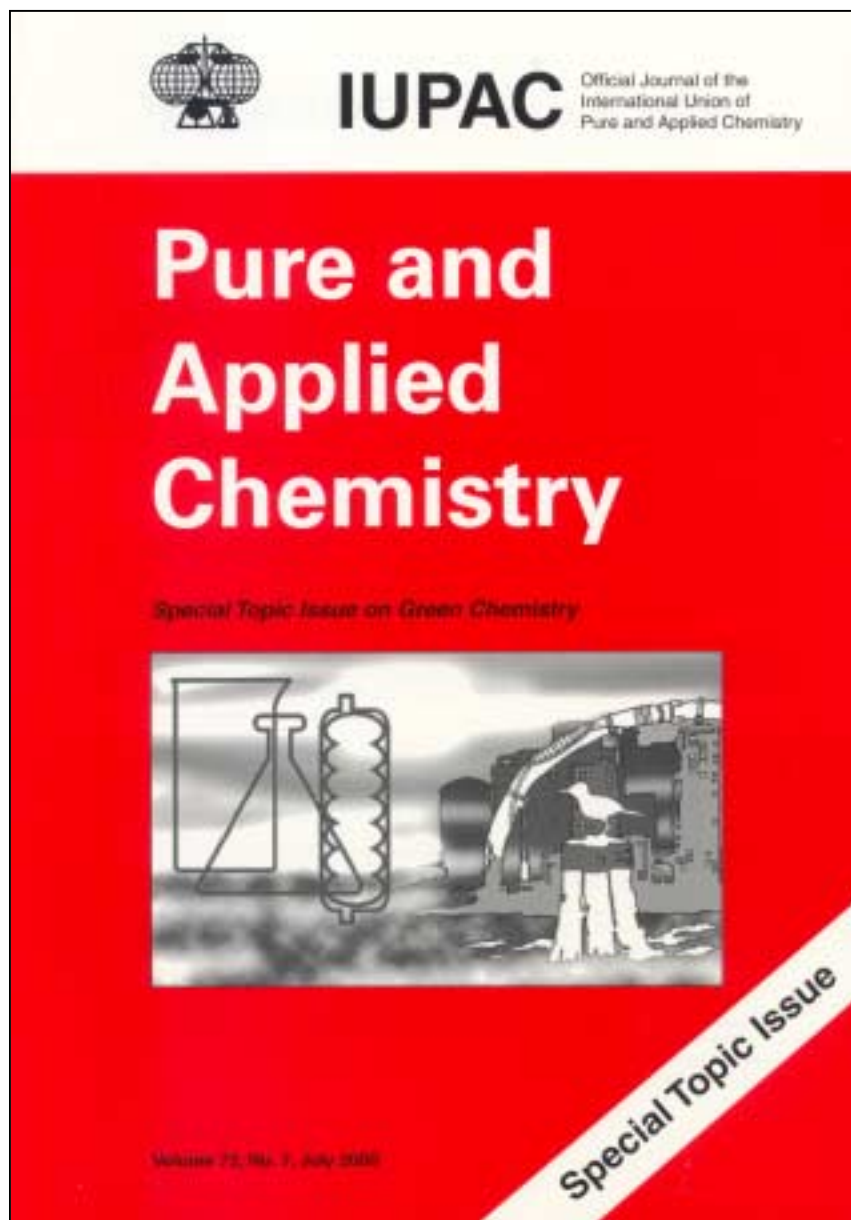
Chemists will play a key role in the realization of the conditions for a sustainable development; to combine **technological progress** with the **safeguard of the environment** is one of the challenges of the new millennium, and **Green Chemistry** may be the winning strategy.

Symposium-in-Print

The selected reviews set out to capture the current status of the discipline and to project the boundless opportunities and challenges confronting contemporary organic synthesis and its practice in changing world, increasingly sensitized to the finite bounds of natural resources and the vulnerability of the biosphere. It offers evidence that current problems are being addressed and can be solved, and engenders expectations that future problems can be anticipated and prevented.

* The influential role of the Organization for **Economic Cooperation and Development (OECD)** is recognized by adoption of their **recommended delineation of topics** for grouping the ensuing reviews.

PAC issue CONTENTS



Foreword

J. Miyamoto and T. Norin

Preface

J. R. Bull

Introductory Overview

P. Tundo, P. Anastas, D. St. Black, J. Breen, T. Collins, S. Memoli, J. Miyamoto, M. Polyakoff, W. Tumas

Symposium-in-Print

edited by P. Tundo, D. St. Black, S. Memoli

Topics* covered include the following:

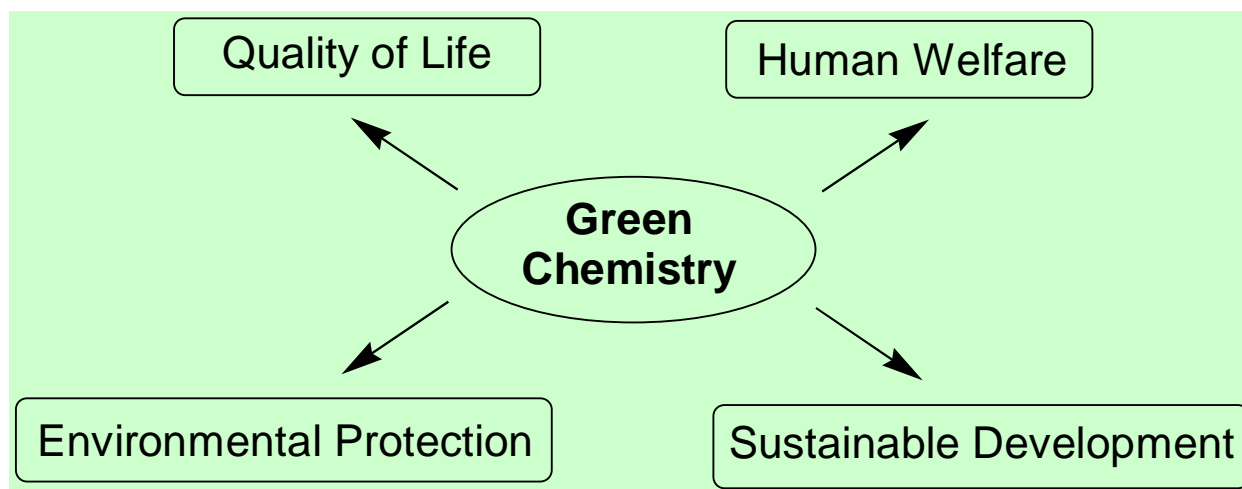
- *Use of alternative feedstocks*
- *Use of innocuous reagents*
- *Employing natural processes*
- *Use of alternative solvents*
- *Design of safer chemicals*
- *Developing alternative reaction conditions*

Synthetic Pathways and Processes in Green Chemistry.

Introductory Overview

P. Tundo, P. Anastas, D. St. Black, J. Breen, T. Collins, S. Memoli, J. Myamoto, M. Polyakoff, W. Tumas

The introductory overview gives a detailed account of the role and interest of IUPAC in promoting this initiative and illustrates the international context, definition, content, and future perspectives of green chemistry.



Green chemistry in the context of the major drivers for new developments in modern chemistry

General Aspects

Atom Efficiency and Catalysis in Organic Synthesis

R. A. Sheldon, Delft University of Technology, The Netherlands

Use of the Life-Cycle Assessment (LCA) toolbox for an environmental evaluation of production processes

M. Herrchen and W. Klein Fraunhofer-Institute for Environmental Chemistry and Ecotoxicology, Schmallenberg, Germany

Use of Alternative Feedstocks *

The use of feedstocks that are both renewable rather than depleting and less toxic to human health and the environment.

Fats and Oils as Oleochemical Raw Materials

K. Hill, Cognis Deutschland GmbH, Düsseldorf, Germany

Utilization of TiO₂ Photocatalysts in Green Chemistry

M. Anpo, Department of Applied Chemistry, Osaka Prefecture University, Sakai, Osaka, Japan

Use of Innocuous Reagents *

The use of reagents that are inherently less hazardous and are catalytic whenever feasible.

Oxidation Reactions in the Synthesis of Fine and Intermediate Chemicals Using Environmentally Benign Oxidants and the Right Reactor System

W.F. Hoelderich, F.Kollmer, University of Technology, RWTH Aachen, Germany*

Cleaner Industrial Processes using Hydrogen Peroxide

W.R. Sanderson Solvay Interlox Ltd, Warrington, UK

Heteropolyacids. Versatile Green Catalysts Usable in a Variety of Reaction Media

M. Misono¹, I. Ono, G. Koyano, and A. Aoshima, ¹Kogakuin University, Tokyo, Japan

Solid Acids and their Use as Environmentally Friendly Catalysts in Organic Synthesis

K. Wilson, J.H.Clark University of York, U.K.

Environment-Friendly Organic Synthesis: the Photochemical Approach

A. Albini, M. Fagnoni, M. Mella, University of Pavia, Italy

Free Radicals in Synthesis: Clean Reagents Affording Oxidative or Reductive Termination

J.A. Murphy, University of Strathclyde, Glasgow, U.K.

Employing Natural Processes *

Use of biosynthesis, biocatalysis, and biotech-based chemical transformations for efficiency and selectivity.

Biocatalysis: Biological Systems for the production of chemicals

A. Schmid, J.B. van Beilen, and B. Witholt, Institute of Biotechnology, ETH, Zürich, Switzerland

Design of Safer Chemicals *

Use of molecular structure design - and consideration of the principles of toxicity and mechanism of action - to minimize the intrinsic toxicity of the product while maintaining its efficacy of function.

The Environmental Issue: A Challenge for New Generation Polyolefins

U. Romano and F. Garbassi EniChem SpA, Research & Technology, S. Donato Milanese, Italy

Use of Alternative Solvents *

The design and utilization of solvents that have reduced potential for detriment to the environment and serve as alternatives to currently used volatile organic solvents, chlorinated solvents, and solvents that damage the natural environment.

Dissolving Biomolecules and Modifying Biomedical Implants with Supercritical Carbon Dioxide

P. B. Webb, P.C. Marr, A.J. Parsons, H. S. Gidda, and S. M. Howdle The University of Nottingham, UK

Frontiers in Green Chemistry Utilizing Carbon Dioxide for Polymer Synthesis and Applications

J. L. Young and J.M. De Simone, University of North Carolina, Chapel Hill, USA

Diels-Alder Reactions in Water

S.Otto and J.B. F. N. Engberts, University of Groningen, The Netherlands.

“Green” Lewis Acid Catalysis in Organic Synthesis

S.Kobayashi and K. Manabe The University of Tokyo, Japan*

Developing Alternative Reaction Conditions *

The design of reaction conditions that increase the selectivity of the product and allow for dematerialization of the product separation process.

Ionic Liquids: Green Solvents for the Future

M. J. Earle and K.R. Seddon, The Queen's University of Belfast, Northern Ireland, U.K.

Phase-Transfer Catalysis: A General Green Methodology in Organic Synthesis

M. Makosza, Polish Academy of Sciences, Warszawa, Poland

IUPAC Working Party Membership

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(University of Nottingham - UK)