Guest Editorial

Frontiers in Organic Chemistry—Recent Advances, Future Directions, Multidisciplinary Interactions

Peter J. Duggan


Organic chemistry’s horizons are wide, ranging from molecular electronics to natural products, from new methods to natural products, from solid-phase synthesis to biocatalysis, from biological activity to chemical theory. All these topics and more feature in this issue of the Australian Journal of Chemistry.

Reviews

Biocatalysis for Sustainable Organic Synthesis

Roger A. Sheldon, Fred van Rantwijk


Biocatalysis has many potential benefits—including environmentally attractive catalysts and solvents, high activities, and chemo-, regio-, and stereoselectivities—to afford synthetic routes which are shorter and generate less waste. This review surveys these advances, taking examples from the synthesis of β-lactam antibiotics, the chemoenzymatic dynamic resolution of alcohols, and the use of cross-linked enzyme aggregates as novel biocatalysts.

Fructose-Permeable Liquid Membranes Containing Boronic Acid Carriers

Peter J. Duggan


The production of sweeteners such as D-fructose is a highly energy-intensive process and hence practical, low-energy alternatives are highly sought. Described here is work based on membrane technology in which boronic acid carriers are utilized, such as that depicted, to bind multiple equivalents of D-fructose in preference to other sugars.

Meccano on the Nanoscale—A Blueprint for Making Some of the World’s Tiniest Machines


Bistable molecular switches, based on non-degenerate [2]catenanes and [2]rotaxanes, have been developed along a timeline that began in 1978. These mechanically interlocked compounds have been integrated into electronic devices that can be switched between on and off conductance states. Evidence for a proposed electromechanical mechanism is presented.
Mimicking the Motion of Life: Catalytically Active Rotaxanes as Processive Enzyme Mimics

Pall Thordarson, Roeland J. M. Nolte, Alan E. Rowan


The Diastereoselective Syntheses of Enantiopure Benzo- and Naphtho-pyrans Related to the Aphid Insect Pigments

Robin G. F. Giles


A Facile Approach to Bicyclo[\(n.2.0\)]alkan-1-ols: An Overview

Wendy A. Loughlin


Rapid Communications

Chiral Conjoined Cavitands

Jacob L. Irwin, David J. Sinclair, Alison J. Edwards, Michael S. Sherburn


The Fluorination (at C5) of Some Derivatives of \(\alpha\)-Glucose

Brian W. Skelton, Robert V. Stick, Keith A. Stubbs, Andrew G. Watts, Allan H. White


Synthesis and Properties of a Mesylated ArgoGel Resin

Christine Le Sann, Andrew D. Abell


The toroidal motif is found in all living organisms, where it is a vital architectural element of progressive catalysts that synthesize and repair DNA. In spite of this utility, few synthetic mimics exist; this paper describes the development of a molecular machine that runs along a polymer thread and carries out oxidation in a processive manner.

The derivatives quinone A 1 and quinone A’ 2 of aphid insect pigments are examples of potential bioreductive dialkylating agents. The first syntheses of these quinones, as well as those of their naturally occurring C3 epimers 3 and 4, using lactate from the chiral pool as the source of asymmetry, are outlined.

Bicyclo[\(n.2.0\)]alkan-1-ols are an integral part of various frameworks of natural products. The reaction of the lithium enolates of simple ketones with (+)-phenyl vinyl sulfoxide and the controlled formation of bicyclo[\(n.2.0\)]alkan-1-ols was investigated. Facile access to bicyclo[\(n.2.0\)]alkan-1-ols \((n = 3–6)\) bearing a bridgehead hydroxyl group was obtained.

The synthesis and crystal structures of rim-linked cavitation bowl dimers are described. These new conformationally restricted, double-cavity chiral hosts bind two ethanol molecules in the solid state (marked spheres).

Fluoro sugars can act as potent, mechanism-based inhibitors of various glycosidases and glycanases. This paper reports the development of methods towards such molecules, for example through the photobromination at C5 of a pyranos(id)e, followed by fluorine exchange using silver tetrafluoroborate in ether/dichloromethane.

Treatment of the commercial resin ArgoGel-OH with methanesulfonylchloride and triethylamine gives ArgoGel-OMs, to which can be coupled—as shown in the graphic—a salt derived from a hydroxycarboxylic acid, an amino acid, or 4-hydroxybenzyl alcohol.
Increased Stability of NO and NS Heterocyclic Carbenes?
David C. Graham, Brian F. Yates


EDF2: A Density Functional for Predicting Molecular Vibrational Frequencies
Ching Yeh Lin, Michael W. George, Peter M. W. Gill


Full Papers

Cyclic Analogues of the Hendrickson ‘POP’ Reagent
Kathryn E. Elson, Ian D. Jenkins, Wendy A. Loughlin


Mutagenic N-Acyloxy-N-alkoxyamides: Probes for Drug–DNA Interactions


Focus

Chemoselective Reduction by Cp₂Zr(H)Cl (Schwartz’s Reagent)
Heedong Yun


Can alkylation or oxidation increase the stability of heterocyclic carbenes?

A new density functional model (EDF2), explicitly designed to yield accurate harmonic frequencies, is introduced. The EDF2 model is found to be significantly more accurate than other DFT models and competitive with the computationally expensive CCSD(T) method for calculating vibrational spectra for a wide range of molecules.

The synthesis of novel cyclic analogues of the Hendrickson reagent and their use in simple dehydration reactions are described. The rate of esterification is considerably increased when the five-membered ring analogue is employed. The use of non-polar solvents with the Hendrickson reagent also increases the rate of ester formation.

The title compounds are direct-acting mutagens towards *Salmonella typhimurium* TA100. From extensive mutagenicity data a QSAR has been derived that predicts activity based upon hydrophobicity, reactivity, and steric effects. Deviations from this QSAR highlight structural features such as planar polycyclic aromatics or sterically bulky groups that can enhance or impede association of small molecules with DNA.

Organozirconocenes mediate a wide variety of organic transformations, in particular, Schwartz and coworkers pioneered the use of hydrozirconation for the functionalization of organic compounds. Recently, however, it has been recognized that the title reagent is also especially useful for effecting chemoselective reductions of carbonyl groups and other compounds.

Book Review

page 385
Author Index

Abell, A. D. 355
Andrews, L. E. 377
Banks, T. M. 377
Banwell, M. G. 385
Bonin, A. M. 377
Clay, S. F. 377
Deng, W.-Q. 301
Duggan, P. J. 279, 291
Edwards, A. J. 339
Elson, K. E. 371
Flood, A. H. 301
George, M. W. 365
Giles, R. G. F. 329
Gill, P. M. W. 365
Gillson, A.-M. E. 377
Glover, S. A. 377
Goddard III, W. A. 301
Graham, D. C. 359
Irwin, J. L. 339
Jenkins, I. D. 371
Le Sann, C. 355
Lin, C. Y. 365
Loughlin, W. A. 335, 371
Muller, R. P. 301
Nolte, R. J. M. 323
Ramirez, R. J. A. 301
Rowan, A. E. 323
Sheldon, R. A. 281
Sherburn, M. S. 339
Sinclair, D. J. 339
Skelton, B. W. 345
Stick, R. V. 345
Stoddart, J. F. 301
Stubbs, K. A. 345
Thordarson, P. 323
van Rantwijk, F. 281
Watts, A. G. 35
White, A. H. 345
Yates, B. F. 359
Yun, H. 383