

AUSTRALIAN JOURNAL OF CHEMISTRY

AN INTERNATIONAL JOURNAL FOR CHEMICAL SCIENCE

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RESEARCH FRONT: Light-Driven Molecular Machines

Essay

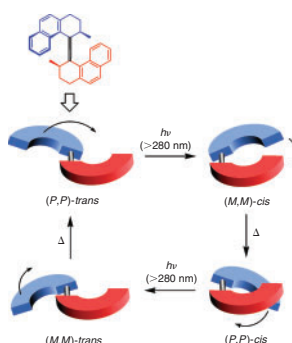
Photochemistry Controls Molecular Motion and Switching

*A. Prasanna de Silva**Aust. J. Chem.* **2006**, *59*, 155–156.

Molecular machines can be found where engineering concepts meet the smallest spaces available to biology. This Research Front explores recent advances in how light can be used to guide and control these tiny machines.

Review

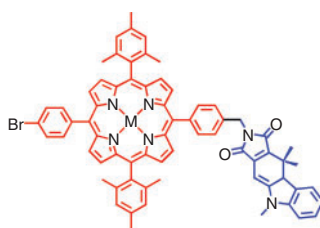
Artificial Molecular Motors Powered by Light

*Alberto Credi**Aust. J. Chem.* **2006**, *59*, 157–169.

Unlike chemical power sources, light can deliver a controlled amount of energy to a specific spatial location without generation of waste products. Light is thus an ideal choice to feed molecular motors, by exploiting photoinduced reactions such as isomerization and electron-transfer processes.

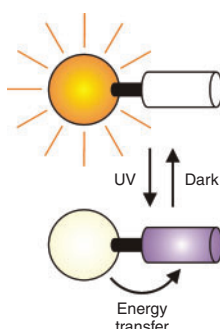
Rapid Communications

Photoswitchable Sensitization of Porphyrin Excited States

*Stephen D. Straight, Yuichi Terazono, Gerdenis Kodis, Thomas A. Moore, Ana L. Moore, Devens Gust**Aust. J. Chem.* **2006**, *59*, 170–174.

Reversible photoisomerization of the photochrome of porphyrin-fulgimide dyads provides photonic switching of the sensitization of the porphyrin first excited singlet state. The cyclic form of the fulgimide transfers excitation energy to the porphyrin with an efficiency $\geq 95\%$. UV light isomerizes the fulgimide to an open form that does not transfer visible light excitation to the porphyrin.

Luminescence Modulation with Semiconductor Quantum Dots and Photochromic Ligands

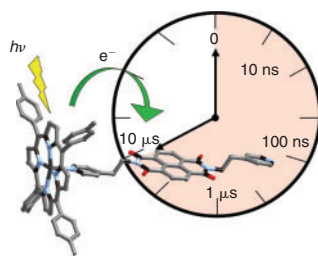
*Massimiliano Tomasulo, Ibrahim Yildiz, Francisco M. Raymo**Aust. J. Chem.* **2006**, *59*, 175–178.

The interconversion of a photochromic spiropyran on the surface of a CdSe–ZnS core–shell quantum dot modulates efficiently the luminescence of the nanoparticle. The transfer of excitation energy from the quantum dot to the coloured state of the photochromic ligand is responsible for the changes in luminescence intensity.

A Simple Dyad Exhibiting Microsecond Charge-Separation in Non-Polar Solvents

Kenneth P. Ghiggino, James A. Hutchison, Steven J. Langford, Melissa J. Latter, Marcia A.-P. Lee, Makoto Takezaki

Aust. J. Chem. **2006**, 59, 179–185.



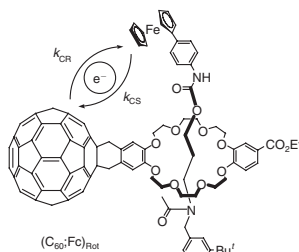
A simple photovoltaic device, comprising two chromophores linked by Zn–N coordination, yields a charge-separated state with a microsecond-scale lifetime. The unusual longevity is due to charge recombination occurring between states with different electron spin character. Control of electron spin may provide a novel paradigm for optimizing light-induced charge-separation processes.

Full Papers

Photoinduced Electron Transfer Processes in Rotaxanes Containing [60]Fullerene and Ferrocene: Effect of Axle Charge on Light-Induced Molecular Motion

Atula S. D. Sandanayaka, Hisahiro Sasabe, Yasuyuki Araki, Nobuhiro Kihara, Yoshio Furusho, Toshikazu Takata, Osamu Ito

Aust. J. Chem. **2006**, 59, 186–192.



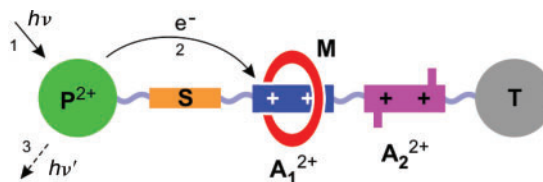
Efficient intra-rotaxane photoinduced electron-transfer processes have been observed by the excitation of C₆₀, which acts as a photosensitized electron acceptor, by using time-resolved fluorescence and transient absorption measurements with changing solvent polarity. Different kinetic behaviors between different fullerene–ferrocene–rotaxane systems revealed the light-induced molecular motions.

A Comparison of Shuttling Mechanisms in Two Constitutionally Isomeric Bistable Rotaxane-Based Sunlight-Powered Nanomotors

Vincenzo Balzani, Miguel Clemente-León, Alberto Credi, Monica Semeraro, Margherita Venturi, Hsian-Rong Tseng, Sabine Wenger, Sourav Saha, J. Fraser Stoddart

Aust. J. Chem. **2006**, 59, 193–206.

Mechanical movement within the bistable rotaxane **BR-II**⁶⁺ composed of a macrocycle M interlocked onto a dumbbell component, containing a light-harvesting unit and two competing electron-deficient units A can be triggered electrochemically and photochemically. While swapping of the electron deficient units in two constitutional isomers **BR-I**⁶⁺ and **BR-II**⁶⁺ does not affect their electrochemical switching behavior, the photochemical switching efficiency suffers in the latter isomer.



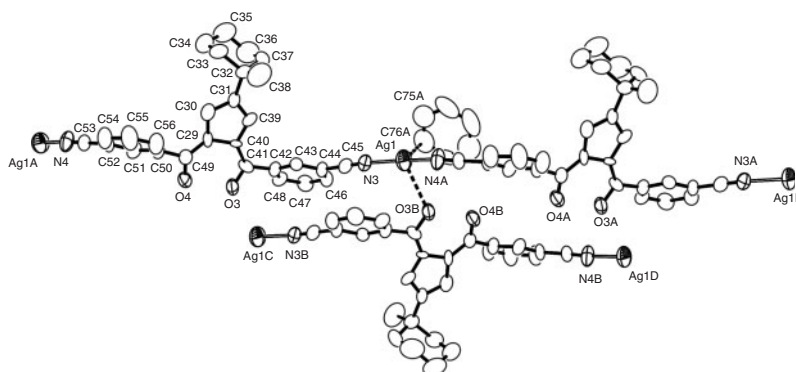
Rapid Communication

One-Dimensional Ag(I) Organometallic Coordination Polymers Generated from a Fulvene-Based Ligand

Peng Wang, Jian-Ping Ma, Ru-Qi Huang, Yu-Bin Dong

Aust. J. Chem. **2006**, 59, 207–210.

As a ligand, 3,3'-bibenzonitrile fulvene can coordinate to soft metal atoms at the middle or ends of the ligand through π – π or metal–heteroatom interactions. This flexibility is exemplified with silver, in which two distinct coordination polymers precipitate from the same synthetic conditions.



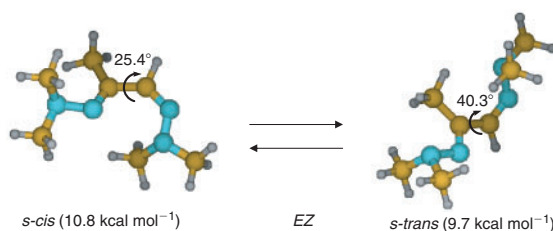
Full Papers

Configurational Assignment and Conformational Study of Methylglyoxal Bisdimethylhydrazones Derived from the 2-Ethoxypropenal Precursor

Leonid B. Krivdin, Lyudmila I. Larina,
Kirill A. Chernyshev, Natalia A. Keiko

Aust. J. Chem. **2006**, 59, 211–217.

The title compound exists unambiguously in a mixture of *EE* and *ZE* isomers (ca. 75:25). This is based on the experimental measurement and high-level ab initio calculations of $^1J(\text{C,C})$ and $^1J(\text{C,H})$ couplings, which depend upon the orientational nitrogen lone pair effect of the two azomethine functions.

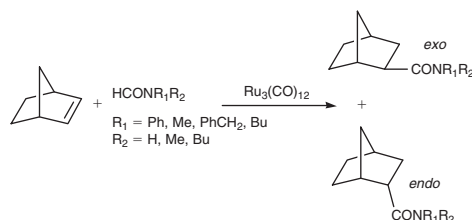


Hydroamidation of Alkenes with *N*-Substituted Formamides

Dilip Chandra Deb Nath,
Christopher M. Fellows,
Toshiaki Kobayashi, Teruyuki Hayashi

Aust. J. Chem. **2006**, 59, 218–224.

A series of hydroamidation reactions of alkenes by formamides are carried out using a $\text{Ru}_3(\text{CO})_{12}$ catalyst in toluene and in a series of ionic liquids. The effect of formamide bulkiness and substitution (mono, di), viscosity of the ionic liquid, and CO pressure on conversion, selectivity, and yield were explored.

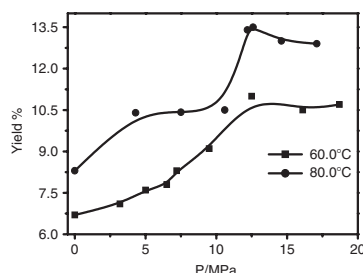


Short Communication

Influence of Compressed Carbon Dioxide on the Oxidation of Cyclohexane with Hydrogen Peroxide in Acetic Acid

Liang Gao, Tao Jiang, Buxing Han,
Baoning Zong, Xiaoxin Zhang,
Jicheng Zhang

Aust. J. Chem. **2006**, 59, 225–228.



Supercritical CO_2 has attracted attention as a replacement for many organic solvents. For the title reaction, increased CO_2 pressure enhances the yield of products cyclohexanol and cyclohexanone. Above a pressure of about 12.6 MPa the phase distribution of reactants changes, and the system becomes insensitive to CO_2 pressure.

Focus

Controlled Modification of Cellulosic Surfaces via the Reversible Addition–Fragmentation Chain Transfer (RAFT) Graft Polymerization Process

Debashish Roy

Aust. J. Chem. **2006**, 59, 229.

Grafting onto a fibre surface provides a convenient route to new materials. If the grafted molecule is amenable to RAFT polymerization, a fine degree of control over the final properties becomes available.

