RESEARCH FRONT: Light-Driven Molecular Machines

Essay

Photochemistry Controls Molecular Motion and Switching

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.

A. Prasanna de Silva


Review

Artificial Molecular Motors Powered by Light

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.

Alberto Credi


Rapid Communications

Photoswitchable Sensitization of Porphyrin Excited States

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 ≥95%. UV light isomerizes the fulgimide to an open form that does not transfer visible light excitation to the porphyrin.

Stephen D. Straight, Yuichi Terazono, Gerdenis Kodis, Thomas A. Moore, Ana L. Moore, Devens Gust


Luminescence Modulation with Semiconductor Quantum Dots and Photochromic Ligands

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.

Massimiliano Tomasulo, Ibrahim Yildiz, François M. Raymo

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


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


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


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

**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


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 $^{1}J$(C,C) and $^{1}J$(C,H) couplings, which depend upon the orientational nitrogen lone pair effect of the two azomethine functions.

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**Hydroamidation of Alkenes with N-Substituted Formamides**

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


A series of hydroamidation reactions of alkenes by formamides are carried out using a Ru$_3$(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.

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**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


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.

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**Focus**

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

Debashish Roy


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.