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Spotlights on Recent *JACS* Publications

IMPROVED RUTHENIUM CATALYSTS FOR *Z*-SELECTIVE OLEFIN METATHESIS

In olefin metathesis, two alkenes undergo C=C bond scission and recombination, and this type of metal-catalyzed reaction is highly useful in the selective creation of new carbon−carbon double bonds. The robust nature of these transformations has resulted in their application in a variety of fields, from organic synthesis to polymer chemistry to biochemistry. *Trans*- or *E*-alkene products are most common because they are more stable, and the synthesis of *cis*- or *Z*-olefins remains a significant challenge.

Now, Robert Grubbs and co-workers have designed and synthesized ruthenium catalysts for *Z*-selective olefin metathesis (DOI: 10.1021/ja210225e). They found that a bulky, chelated adamantyl ligand is critical for high levels of *Z*-selectivity, and that adding a nitrato (NO_3^-) ligand as well gave the best reactivity and selectivity. The researchers found that other ligand combinations had significant but unpredictable effects on the metathesis reactions.

The authors demonstrate an efficient one-step synthesis of an industrially relevant pesticide. It is likely that these catalysts will be broadly used, for example in chemical biology for the synthesis and study of membrane lipids with *cis* double bonds, or in the total synthesis of *Z*-olefin-containing natural products. **Sonja Krane, Ph.D.**

MEMORY STORAGE IN AN ALL-PHOTONIC DATA FLIP-FLOP

Scientists investigate molecule-based logic operations with the goal of creating circuits that take up less space than their semiconductor counterparts and are easily assembled. Ideally, these molecules will someday work in light-based (photonic) systems to create a new generation of devices and computers that use pulses of light through materials rather than electrons through semiconductors, resulting in greatly increased speeds.

Computer memory in conventional silicon-based circuits uses several types of logic circuits, and D flip-flops are the most common way to store information. Creating a molecule-based D flip-flop is challenging, and Joakim Andréasson, Uwe Pischel, and co-workers report the successful creation of an all-photonic, molecule-based D flip-flop (DOI: 10.1021/ja2100388).

The team used a photoisomerizable fulgimide molecule that reversibly changes to a colored form with exposure to ultraviolet light and returns to the original form with exposure to visible light. The colored form fluoresces, and measurement of the fluorescence signal is used to characterize the state of the molecule-based switch. An experimental setup composed of an Nd:YAG laser and nonlinear crystals was used to provide the required light signals as "inputs" into the logic circuit. The authors demonstrate that the fulgimide molecule in solution acts as a logic element, storing memory in repeatable cycles in the manner of a D flip-flop. **Polly Berseth, Ph.D.**

CONTROLLING CRYSTALLIZATION WITH THE HELP OF MICROGELS

The way a compound is crystallized dramatically affects its physical, mechanical, and biological properties, yet the process of crystallization is not well understood and often difficult to control. Researchers led by Bernhardt L. Trout have now shown that microgels can be used to guide the crystallization process (DOI: 10.1021/ja210006t).

During crystallization, many compounds are able to form distinct types of crystal structures, known as polymorphs, depending on the conditions used. Some compounds can crystallize as different polymorphs, even under seemingly identical conditions. Other compounds form a mixture of polymorphs regardless of the conditions used. The often unpredictable nature of crystallization poses a problem when the compound is a pharmaceutical drug that needs to have a certain crystal structure in order to properly exert its effects.

For this reason, the research team set out to develop a technique for selectively directing the process of crystallization. They created microgels with tunable properties and performed a systematic study to understand how the pore size and chemical composition of the hydrogels direct the crystallization process of two model compounds. This work takes researchers one step closer to understanding how polymorph crystallization is impacted by confined environments, such as the nanoporous environment inside microgels. **Christine Herman**

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