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Spotlights on Recent *JACS* Publications

FLUORESCENT MARKER CAPTURES CATALYSIS CLUES

Structural distortions in nucleic acids can change how DNA replicates and which proteins are synthesized. Nucleic acid distortions can occur when a small part of the DNA or RNA—for example, a base such as adenine or cysteine—undergoes a small shift in its acidity. That shift entails an electronic charge that moves the base's position relative to the rest of the nucleic acid strand. Jennifer Wilcox and Philip Bevilacqua report how they use a small fluorescent marker to detect those shifts and distortions (DOI: 10.1021/ja3125299).

The researchers use the fluorescent molecule 2-aminopurine (2AP) because it is similar to the base adenine and can form hydrogen bonds with thymine or uracil, other bases. When they insert 2AP in a nucleic acid near an ionizing base, the molecule loses some of its fluorescent shine. Then they quantify how much the fluorescence changes with changing acidity in the bases. When they compare their fluorescent measurements to nuclear magnetic resonance measurements, the existing standard for detecting acidity in nucleic acid bases, they find that the 2AP method is faster and 3−5 times more sensitive while giving comparable results. **Lucas Laursen**

METATHESIS REACTION MAKES *Z*-ISOMER OF COMMON ORGANOBORON REAGENTS

Allyl- or alkenylboron compounds are useful reagents for carbon−carbon bond formation reactions in organic synthesis. The arrangement of the double bond in either of these types of compounds affects the resulting stereochemistry of the product. There are many ways to make the less-crowded *E*-isomers of these compounds, where the bulky groups are on the opposite sides of the double bond. Only a few methods, and even fewer catalytic reactions, can make the *Z*-isomers.

Amir Hoveyda and colleagues have developed a tungsten- or molybdenum-catalyzed reaction to build *Z*-isomers of those protected boron compounds through olefin metathesis (DOI: 10.1021/ja403188t). The researchers build a trimethoxyaryl-substituted vinyl(pinacolato)boron and then use a Suzuki reaction to displace the protected boron with another substituted aromatic ring. One of the resulting products, combretastatin A-4, is an antitumor agent, and the stereochemistry of the double bond matters a lot: The *Z*-isomer of the drug is 10 000 times more active than the *E*-isomer.

This new metathesis approach provides a way to prepare organoboron reagents, particularly sterically hindered compounds, which cannot be accessed with the current ruthenium catalysts. The method may also offer a more direct route to useful industrial or pharmaceutical products. **Melissae Fellet, Ph.D.**

PHOTOCHROMIC MOLECULES CONDUCT AT THE FLIP OF A SWITCH

In molecular electronics, one of the major challenges involves building devices that integrate molecules with properties that researchers can control with external stimuli, such as light, motion, magnetic field, or temperature. Now, researchers demonstrate the first single-molecule conductance measurements on a unique class of photoswitchable molecules, showing them to be promising candidates for the molecular building blocks of optoelectronic devices (DOI: 10.1021/ja401484j).

A team led by Thomas Wandlowski finds that reversible structural changes cause a class of photochromic molecules, known as dimethyldihydropyrene (DHP)/cyclophanediene (CPD) isomers, to switch between low and high conductivity. The molecules exhibit a high ratio in conductance between the "on" and "off" states and are stable for more than five ON/OFF cycles.

The system's versatility makes it particularly attractive to researchers. The molecules are both photochemically and thermally reversible and can be chemically functionalized in a variety of ways to tailor their properties for specific applications. Photochromic molecules whose conductivity can be reversibly switched on and off hold promise for being developed into nanoscale building blocks for miniaturized molecular electronic devices. **Christine Herman, Ph.D.**

DICED ELECTROPHORESIS GEL ASSIGNS BIOCHEMICAL ACTIVITY TO PROTEINS

Genomes these days are deciphered with almost routine regularity. Finding the protein-coding genes is easy, but figuring out what the proteins do is not as simple. Tetsuo Nagano and colleagues describe a sensitive and high-throughput method to assign biochemical activity to enzymes (DOI: 10.1021/ja401792d).

In the diced electrophoresis gel (DEG) assay, a proteome is resolved by size and charge on a native two-dimensional polyacrylamide gel and then "diced" into small pieces, which are loaded into a 384-well microtiter plate. Each well is tested for the desired enzymatic activity using a tailored fluorogenic substrate (or LC-MS), and positives are identified by peptide mass fingerprinting.

The DEG assay detects as little as 30 pg of β-galactosidase, making it over 1000 times more sensitive than earlier methods. The team also identifies enzymes that degrade formylmethionyl-leucyl-phenylalanine (fMLF), a chemical signal produced in damaged tissues. Using an fMLF variant that releases a coumarin dye upon digestion, they pinpoint an acylamino acid-releasing enzyme as one of the primary fMLF-cleaving enzymes in mouse liver.

"We believe that the DEG assay represents an efficient platform for identifying proteins with biologically and pharmacologically important activities and evaluating the relative contributions of multiple proteins that exhibit a particular activity," the authors conclude. **Jeffrey M. Perkel**

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