

## Spotlights on Recent JACS Publications

### ■ BORONIC ACID BUILDING BLOCKS FOR HYDROGEN BOND RECOGNITION

Aryl boronic acids are among the most versatile molecular building blocks in supramolecular chemistry and materials science. Despite their ease of preparation and dynamic covalent reactivity, and the structural diversity of aromatic boronic acids, researchers have marginally explored their ability to participate in hydrogen bonding with other molecules for applications in molecular recognition.

Now, Davide Bonifazi and his team describe the first combined study of solution-phase and solid-state aromatic boronic acids interacting via hydrogen bonds with complementary acceptor molecules (DOI: [10.1021/jacs.6b11362](https://doi.org/10.1021/jacs.6b11362)). Here, boronic acids can self-adapt while retaining their recognition properties, taking on different shapes depending on the bulkiness of substituents. A supramolecular hydrogen-bonded polymeric ribbon is constructed through the donor–acceptor interaction between a diboronic acid and a tetraazaphthalene.

The findings may lead to developments in design of programmed boronic acids as a potent building block through hydrogen bond recognition to construct supramolecular complexes with unique structural and physical properties for applications in organocatalysis and in engineering of functional organic materials and printed electronics.

Christine Herman, Ph.D.

### ■ A GENEROUS PORE: TOASTING THE NEW ORDERED MESOPOROUS MATERIALS

Ordered mesoporous materials (OMMs)—functional materials with regularly porous structure, uniform pore size ranging from 2 to 50 nm, high surface area, and a wide range of compositions—have traditionally been synthesized using commercially available soft templates, such as surfactants and amphiphilic block copolymers. However, these OMMs have drawbacks, including small pore sizes and amorphous or semicrystalline frameworks that limit applications. In a new Perspective, Dongyuan Zhao and co-workers detail advances in OMMs synthesized instead with tailor-made block copolymers, which offer large pore sizes, high surface area, and the potential for highly crystalline frameworks (DOI: [10.1021/jacs.6b11411](https://doi.org/10.1021/jacs.6b11411)).

Using poly(ethylene oxide)-*b*-polystyrene (PEO-*b*-PS) as a soft template due to its convenient synthesis, the authors detail methods and strategies for controllable synthesis of OMMs based on this block copolymer. Modifications, such as different additives, changing the water content, and applying a shear force, can tailor the structure of the resulting OMMs. Highly crystalline OMMs can be obtained with metal oxides. OMMs crafted with PEO-*b*-PS and other tailor-made block copolymers hold promise for many applications, including catalysis, sensors, and energy conversion and storage. The authors suggest research directions, including OMMs with new compositions, morphologies, and incorporated functional components.

Christen Brownlee

### ■ BINDING A SPECIFIC PEPTIDE IN THOSE DIMPLES

Molecular recognition is a tenet of biology, allowing biological molecules to find their binding partners. Scientists have tried to replicate evolution's success by developing a method to bind peptides with high sequence-specificity in water. Such an approach may have many applications, such as inhibiting or detecting peptide neurotransmitters to better understand their function in the brain. Now, Yan Zhao and colleagues describe an approach for making “synthetic antibodies” that recognize a range of peptides with high specificity (DOI: [10.1021/jacs.6b12949](https://doi.org/10.1021/jacs.6b12949)).

The researchers start with a micelle and, using appropriate functional modification, introduce a series of hydrophobic “dimples” in the cross-linked micelle that specifically align with the pattern of hydrophobic amino acids in a peptide template. The resulting molecularly imprinted nanoparticle is then able to bind that particular peptide based on the size, number, and location of hydrophobic amino acids. The approach takes only 2–3 days and works for both large and small peptides. Affinities of up to 20 nM for biologically active peptides are reached. Also, switching just one hydrophobic residue for another significantly lowers the affinity of the nanoparticle for peptide, underscoring the specificity of the approach.

Erika Gebel Berg, Ph.D.

### ■ SPLITTING WATER: ELIMINATING HYDROGEN PEROXIDE BY CONTROLLING ELECTRON SPIN

An efficient and economical way to split water molecules into hydrogen and oxygen within a photoelectrochemical cell would be a game-changer for the use of hydrogen as fuel. But several factors limit the efficiency, and the formation of hydrogen peroxide as a byproduct can negatively impact the oxidative stability of the photoelectrodes. Researchers led by E. W. Meijer and Ron Naaman demonstrate coating electrodes with a chiral organic semiconductor can impose spin selectivity and lead to the dramatic suppression of hydrogen peroxide, enhancing current through the cell (DOI: [10.1021/jacs.6b12971](https://doi.org/10.1021/jacs.6b12971)).

The team uses magnetic conducting atomic force microscopy to determine that chiral dye aggregates can act as spin filters. After electrodes are coated with chiral dye aggregates, they emerge with higher current densities for generating oxygen and low production of the hydrogen peroxide byproduct. The results provide new insights into the role of spin selectivity in oxygen generation, shed light on the mechanism underlying the formation of oxygen, and add to understanding of the underlying mechanism of spin selectivity in multiple electron-transfer reactions. The work may help pave the way toward better chiral dye-sensitized photoelectrochemical cells.

Christine Herman, Ph.D.

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