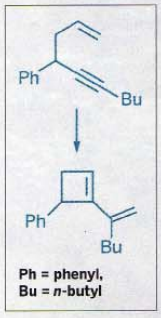
STM IMAGE ANALYSIS OF POLYMERS SIMPLIFIED

Scientists at the Naval Research Laboratory have developed a simple procedure by which scanning tunneling microscopy (STM) can be used to record atomic-resolution images of polymers and other large molecules (*Surf. Sci.* **2008,** *602,* 3). Typically, researchers must choose between vacuum or ambient conditions. Vacuum conditions lead to favorable imaging and maintain sample cleanliness but complicate sample handling; ambient conditions simplify experiments but can deteriorate image quality. To overcome these trade-offs, Arnaldo R. Laracuente and coworkers prepared a hydrogen-terminated silicon crystal under vacuum. They deposited a solution-phase analyte (a pentiptycene-based copolymer) onto the crystal, which serves as a support and reference for structure analysis, and then returned the crystal to high vacuum and recorded polymer images. Chemist John J. Boland of Trinity College Dublin says the beauty of this approach is that it eliminates the need for sophisticated sample-delivery systems yet provides the full benefits of vacuum-based STM imaging.

LITTLE-RING METATHESIS

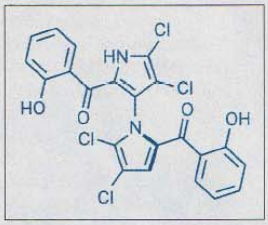
Ring-closing metathesis has been used to establish a new route to functionalized cyclobutenes, a surprising result given the generally accepted idea that ring strain precludes formation of small cyclic rings using this approach (*J. Am. Chem. Soc.* **2008,** *130,* 1562). Ring-closing metathesis is popular for synthesizing medium and large rings from diene or enyne precursors. But strained cyclopropenes and cyclobutenes can easily be reopened by the carbene catalyst. In fact, cyclobutenes are starting materials for ring-opening metathesis polymerization and other metathesis reactions. However, Olivier Debleds and Jean-Marc Campagne of Institut Charles Gerhardt Montpellier, in France, surmised that the orientation of 1,5-enynes previously made in their lab might lead to less reactive cyclobutenes under the appropriate conditions. By using the Hoveyda-Grubbs second-generation ruthenium catalyst, the researchers were able to prepare several cyclobutenes (one example shown). They subsequently used the cyclobutene shown in a Diels-Alder reaction with a cyclic azo derivative to form a tricyclic compound, a reaction that could prove useful in natural products synthesis.



Ph = phenyl,
Bu = *n*-butyl

ANTIBIOTICS FROM THE DEEP

A veritable treasure trove of medicinally relevant compounds has once again been found by plumbing the oceans' depths. William Fenical and coworkers at Scripps Institution of Oceanography have identified an unusual pair of antibiotics isolated from bacteria that inhabit ocean sediments. The compounds, dubbed marinopyrrole A (shown) and B, possess an N,C2-linked bispyrrole motif that's never been observed in natural products (*Org. Lett.*, DOI: 10.1021/ol702952n). Postdoc Chambers C. Hughes isolated the chiral molecules as single atropo-enantiomers, suggesting that their biosynthesis involves a critical enzyme-mediated pyrrole coupling. Fenical and his team were able to isomerize marinopyrrole A to its nonnatural atropo-enantiomer by heating it. This enantiomer, along with the natural marinopyrroles, exhibits promising antimicrobial activity against methicillin-resistant *Staphylococcus aureus*. By focusing a synthetic effort on the marinopyrroles' novel bispyrrole structure, Fenical says, chemists might discover new compounds for fighting drug-resistant infections.



DRYING PAINT DELIVERS A SILVER BULLET

About the simplest method one could imagine for endowing oil-based house paint with antibacterial properties—adding some reagents and watching the paint dry—has been developed by researchers at the City College of New York and Rice University (*Nat. Mater.*, DOI: 10.1038/nmat2099). Unsaturated hydrocarbons in vegetable oil paints dry by an autooxidative, free-radical cross-linking reaction. CCNY's George John and coworkers conceived of chemistry that rides piggyback on free radicals. They add a silver salt to an alkyd paint, and as the painted surface dries, free radicals reduce the silver ions, forming antibacterial silver nanoparticles. In this green chemistry technique, "we are using a natural process to make nanoparticles in situ, without any additional solvents or energy," John notes. The coatings show antibacterial activity toward *Escherichia coli* and *Staphylococcus aureus* bacteria. Although antibacterial silver nanoparticle paints are commercially available, the new approach "uses natural materials and is quite simple," comments Michigan State University chemist Merlin L. Bruening.

CAUTIONARY TALE ON AMYLOID INHIBITORS

Amyloid inhibitors' tendency to aggregate may be the key to their ability to block amyloid polymerization, according to a new study (*Nat. Chem. Biol.*, DOI: 10.1038/nchembio.65). The finding provides a cautionary tale for the development of drugs for Alzheimer's and other neurodegenerative diseases associated with the polymerization of proteins into amyloid fibrils. Brian K. Shoichet, Brian Y. Feng, and coworkers at the University of California, San Francisco, show that eight small molecules known to form colloidal aggregates in solution actually inhibit fibril formation. What's more, they found evidence that three previously identified amyloid inhibitors—the flavonoid baicalein, 4,5-dianilinophthalimide, and the hydroxyquinoline clioquinol—form similar colloidal aggregates. Colloidal aggregates nonspecifically inhibit their protein prey by physical sequestration. The mechanism by which the aggregation-prone amyloid inhibitors act appears to be similar, they report.