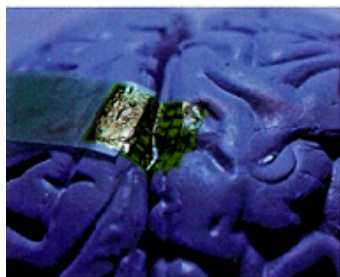


## SILKEN ELECTRONICS

**BIOMATERIALS:** Electrode arrays constructed from films of silk cling to the brain

Silk-supported electrode array wrapped on a model of the brain.



**B**Y BUILDING ELECTRONICS on substrates of silk, scientists have created devices so thin and flexible that they hug the brain's ridges and grooves (*Nat. Mater.*, DOI: 10.1038/nmat2745). The technology could improve the interface between the brain and electronic devices, according to its creators, and could lead to novel diagnostics and therapies.

"We were trying to develop a new strategy for intimately and noninvasively integrating electronics with the human brain," says John A. Rogers, a University of Illinois, Urbana-Champaign, chemistry professor who spearheaded the work along with University of Pennsylvania bioengineering professor Brian Litt. To that end, the researchers created ultrathin electrode arrays with an open-

mesh design made from conventional materials.

On their own, however, these netlike arrays were simply too floppy to mount onto the bumps and ridges of the brain. The team reasoned that constructing the arrays on a soluble substrate that is both thin and flexible would provide the support they were looking for and would eventually dissolve away.

Silk turned out to be the ideal material, Rogers explains, because it's water-soluble, forms smooth films, and is biocompatible (silk sutures have been approved by the Food & Drug Administration). When the silk dissolves, it leaves behind an electronic mesh that gently shrink-wraps the brain tissue.

"The result is a high-quality interface with the capability for measuring electrical activity in the brain with unmatched precision in a manner that does not damage the tissue in any way," Rogers says. "The potential applications range from systems for diagnosing and treating epilepsy to devices for brain-machine interfaces for controlling prosthetics," he adds.

It's a "very clever but simple approach," says William M. Reichert, a professor of biomedical engineering at Duke University. "This is a very interesting technology because it addresses two critical issues: intimate contact with nonuniform and hydrated tissues, and it avoids the trauma of puncture wounds."—BETHANY HALFORD

## CARBENE SIZE GUIDES COUPLING

**ORGANOMETALLIC CHEMISTRY:** Ligand bulk affects outcome of aldehyde-alkyne pairing

**W**ITH THE HELP of carbene ligands, chemists have found new ways of controlling cross-coupling reactions that lead to allylic alcohols. Choosing either large or small ligands for a nickel catalyst helps define which region of an alkyne will couple to an aldehyde to form the alcohol, a level of control synthetic chemists have traditionally found difficult to achieve.

Allylic alcohols are common motifs in antibiotics

and other pharmaceuticals, and although chemists have developed catalytic and enantioselective couplings of aldehydes and alkynes, controlling the regiochemistry of such metal-catalyzed couplings is still not straightforward. To avoid getting mixtures of products, researchers must turn to alkynes that are highly biased toward one outcome or the other or that have directing groups. Such workarounds limit the overall utility of the reaction.

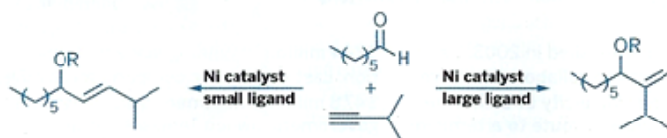
Now, John Montgomery and graduate students Hsainair A. Malik and Grant J. Sormunen of the University of Michigan, Ann Arbor, have found that the size of N-heterocyclic carbene ligands of a nickel catalyst dictates the regiochemical fate of the reactions (*J. Am. Chem. Soc.*, DOI: 10.1021/ja102262v). Bulky ligands lead to bond formation at the more hindered end of the alkyne, whereas small ligands lead to the opposite outcome. No ligand is the single best choice for either scenario yet, Montgomery says. "We're trying to tease out those rules now," he says.

With their nickel-catalyzed method, the team was able to control regioselectivity with less biased alkynes and was also able to override the selectivity that would be expected of certain biased alkynes. Now, they are delving into a wider range of alkynes and aldehydes to test the reaction's scope, as well as improving their ligands.

The Montgomery group's work "solves a long-standing problem in chemical reactivity" and "provides a powerful example of the impact that diverse N-heterocyclic carbenes can have in control of catalytic reactions," says Scripps Florida chemistry professor Glenn Micalizio, whose lab also develops regioselective cross-coupling reactions.—CARMEN DRAHL

### COMMANDING A COUPLING

Ligand size sets this pairing's regiochemical course



R = silicon protecting group