Chemical & Engineering News
Serving the chemical, life sciences and laboratory worlds

Latest News

January 10, 2011
Volume 89, Number 2
p. 8

Multimetal Organic Complexes

Synthesis: Method couples various metals in predetermined sequences

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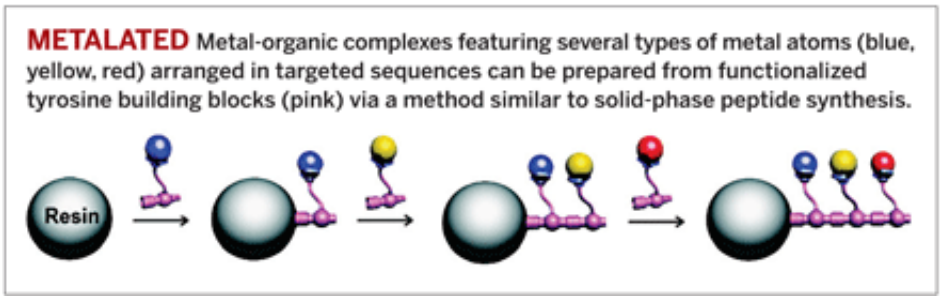

Omar Yaghi/UCLA View Enlarged Image

Making molecules that contain multiple metal atoms and more than one type of metal is notoriously tough. But that's exactly what a research team based in Japan and the U.S. has done.

The researchers have devised a method to string metal-containing molecular segments in specific sequences and lengths to form surface-tethered metal-organic complexes, including one with three types of metals and a total of six metal atoms (*J. Am. Chem. Soc.*, DOI: 10.1021/ja1097644). Complexes of this type may mediate highly selective catalytic reactions or "cascading reactions."

The underlying design strategy is an adaptation of the Merrifield solid-phase peptide synthesis, according to Omar M. Yaghi of UCLA, who led the study.

To make the complexes, Yaghi; Kentaro Tashiro of the National Institute for Materials Science, in Tsukuba, Japan; and coworkers functionalized tyrosine with a multidentate ligand and reacted the product with platinum, rhodium, or ruthenium. Then they attached one of those building blocks to a polymeric resin and linked additional building blocks to the surface-bound unit to tailor-make products featuring a desired number of metal atoms in a particular sequence. For example, they prepared one of the complexes by coupling units containing Rh, Pt, Ru, Pt, Rh, Pt—in

that order.

“The idea of extending the Merrifield solid-phase synthesis to metal-coordination complexes to create predetermined and varying metal sequences is brilliant,” says Northwestern University’s Mercouri G. Kanatzidis, a materials chemistry specialist.

This technique has the potential to inspire broad-based activity in tailor-made complexes for specific applications, Kanatzidis says. “I am curious to see how people will use this approach. Who knows,” he laughs, “finally we may be able to synthesize the Co-Ca-Co-La molecule.”

Chemical & Engineering News
ISSN 0009-2347

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