Latest News

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Materials Chemistry

Imparting Chirality To Metals

Method imprints solid with handedness derived from molecules

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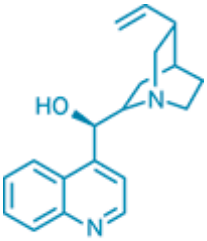
Chirality can be induced in metals, a class of inherently achiral materials, by crystallizing a metal compound with chiral organic dopants, according to researchers in the Netherlands and Israel (*Nat. Chem.* **2009,** *1*, 160). In addition to uncovering new enantioselective catalysts, the study outlines a general method for making various types of chiral metals and novel chiral metallo-organic composites.



Cinchonidine

By reducing a palladium salt in the presence of cinchonidine or closely related chiral alkaloids, Laura Durán Pachón and Gadi Rothenberg of the University of Amsterdam synthesized porous composites consisting of nanometer-sized aggregates of metal crystallites and pockets of dopant molecules. On the basis of spectroscopy measurements made with circularly polarized light, the team demonstrated that the composites have imprinted chirality and that extracting the organic fraction with solvents forms porous metal products that are also chiral.

The group, which includes researchers at the Hebrew University of Jerusalem and the Weizmann Institute of Science, in Rehovot, Israel, showed that the composites can catalyze asymmetric reactions, albeit with modest results. For example, they showed that hydrogenation of isophorone, a cyclic keto-olefin, yields the R enantiomer of the corresponding cyclohexanone with 16% enantiomeric excess.

The investigation builds on the team's earlier work in making metal composites that contain organic components. The present study stands out, however, by being the first case in which a metal, rendered chiral by an organic modifier, retains its chirality in the absence of the dopant.

Peter McBreen, a chemistry professor at Laval University, in Quebec, comments that the study suggests new ways of exploring how chirality might be transferred to metals. He notes that although the reported catalytic performance is modest, this strategy "holds promise for developing robust heterogeneous asymmetric catalysts." The key thing in McBreen's view is that "there is great scope for both fundamental and applied extensions to this work."

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