

Science Concentrates

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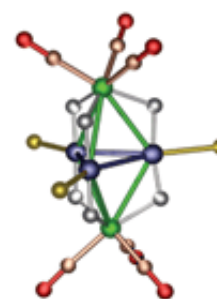
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Pt-Re complex adds lots of H₂

A platinum-rhenium bimetallic cluster with an unusually high degree of electronic unsaturation around the metal atoms has been discovered to add an equally unusual amount of hydrogen, forming a hydride complex. The discovery could provide new insight into hydrogenation catalysis and hydrogen storage applications, according to Richard D. Adams and Burjor Captain of the University of South Carolina, Columbia, who conducted the research (*Angew. Chem. Int. Ed.* **2005**, *44*, 2531). Adams' group has been synthesizing platinum and palladium compounds containing the bulky tri-tert-butylphosphine ligand (L), including a trigonal bipyramid cluster, Pt₃Re₂(CO)₆(L)₃, which is deficient by 10 electrons. It reacts at room temperature with H₂ (a good source of electrons) to form the hexahydride complex shown (Re is green; Pt, purple; H, white; P, yellow; tert-butyl groups omitted; and CO, red). "The addition of three equivalents of H₂ to an intact cluster complex is unprecedented," Adams says, "although there are examples of complexes that contain more hydrogen than this one."



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Catalysis with serial ligands

Two ligands play independent roles in bringing about different steps of a catalytic cycle, scientists have observed. The phenomenon, dubbed serial ligand catalysis, may be occurring widely, but the work of M. Christina White and coworkers at Harvard University may be the first to explicitly demonstrate it (*J. Am. Chem. Soc.*, published April 21, dx.doi.org/10.1021/ja0500198). They obtained evidence for serial ligand catalysis from a mild and highly selective palladium-catalyzed allylic oxidation of terminal olefins. The data are consistent with a palladium-phenyl vinyl sulfoxide complex promoting the initial cleavage of the allylic carbon-hydrogen bond followed by a palladium-benzoquinone complex promoting the functionalization of the allylic carbon. The conventional approach to homogeneous catalysis of one-metal/one-ligand combination may be inefficient when a reaction involves several product-forming steps that impose different demands on the metal, White says. "One-metal/multiple-ligand combinations may result in uniquely mild and selective solutions."

Fuel cell cleans water, makes hydrogen to boot

A prototype microbial fuel cell designed to generate a steady stream of electricity as it cleans wastewater now has been modified to produce hydrogen instead (*Environ. Sci. Technol.*, published April 22, dx.doi.org/10.1021/es050244p). Bruce E. Logan and Hong Liu at Penn State University originally designed their flow-through fuel cell to use bacteria living on the carbon anode to oxidize organic matter in wastewater. Hydrogen ions and