TURNING METHANE INTO METHANOL

CATALYSIS: Recyclable platinum compound mediates oxidation at low temperature

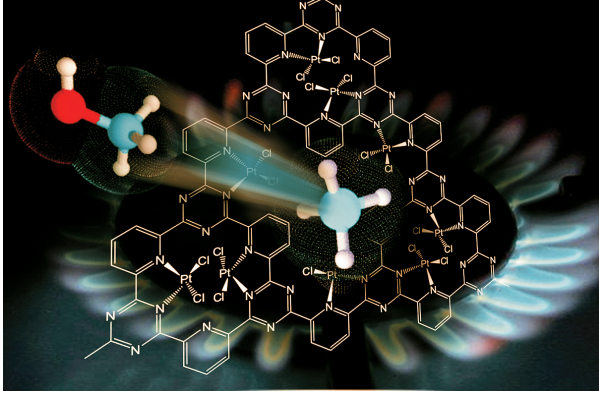
METHANE CAN BE converted directly to methanol at low temperature through the actions of a solid platinum-based catalyst that exhibits high catalytic activity even after repeated recycling, according to scientists in Germany (*Angew. Chem. Int. Ed.* **2009,** *48,* 6909). The study may advance efforts to commercialize technology for converting methane to high-value and easily transported products.

Large reserves of natural gas that sit untapped in remote locations could be exploited commercially if cost-effective methods were available for converting methane, the principal component of natural gas, to easily transported liquids, such as methanol. A number of commercial processes that transform methane to liquid hydrocarbons already exist, but most are based on multistep conversions that proceed via synthesis gas (CO and hydrogen) and high temperatures (>600 °C). Various researchers have also described catalysts that directly convert methane to methanol, but most of those systems suffer from overoxidation, resulting in a large fraction of unwanted by-products.

Now, Regina Palkovits and Ferdi Schüth of Max Planck Institute for Coal Research, in Mülheim, and coworkers report that a triazine-based polymer complex, which they formed from dicyanopyridine trimers and a platinum salt, selectively transforms methane and oleum (fuming sulfuric acid) to methanol in high yield at roughly 200 °C.

The new catalyst shares similarities, such as N–Pt linkages, with a solution-phase methane-to-methanol catalyst developed more than a decade ago by researchers at Catalytica, in Mountain View, Calif. But unlike the older system, which has not been commercialized, the new catalyst is a solid and therefore easily separated from liquid products and recycled. The Mülheim team reports that the new material retains its high catalytic activity even after a half-dozen runs.

"This is an elegant method for immobilizing platinum in a well-defined manner," says Krijn P. de Jong, a professor of chemistry and catalysis at Utrecht University, in the Netherlands. The development is "noteworthy," he says, but he points out that using fuming sulfuric acid as an oxidant poses significant challenges regarding compatible materials and cost.—MITCH JACOBY



REGINA PALKOVITS/MAX PLANCK INSTITUTE FOR COAL RESEARCH

The Pt-triazine-polymer catalyst depicted here mediates low-temperature conversion of methane to methanol and is readily recycled.

COST OF REACH UNDERESTIMATED

CHEMICAL REGULATION: EU's chemical testing program may require millions more animals and euros than expected

COMPLYING WITH European Union legislation that requires retroactive toxicological testing of tens of thousands of chemicals may cost six times more than expected and 20 times more in experimental animals, according to a new report published online on Aug. 26 in *ALTEX,* the official journal of the Center for Alternatives to Animal Testing (CAAT) at Johns Hopkins University and three other related groups. The report estimates that 54 million animals will need to be sacrificed and $13.5 billion (€9.5 billion) spent over a decade to abide by the EU legislation.

Introduced in 2006, the Registration, Evaluation, Authorization & Restriction of Chemical substances (REACH) program aims to assess the potential health hazards of chemicals introduced to the market before existing safety evaluations for new chemicals were set in place in 1981.

REACH is the "biggest investment into consumer safety ever," says Thomas Hartung, director of CAAT, former EU regulator, and coauthor of the report and of a related *Nature* commentary (**2009,** *460,* 1080). "As a toxicologist, I'm in favor of REACH's aims," he tells C&EN. "But I think we ought to do this right."

Earlier this year, the number of chemicals preregistered in REACH passed the 140,000 mark, several times higher than the 29,000 substances EU regulators had expected on the basis of 1994 industry data (C&EN, April 27, page 18). Although there was likely a lot of redundant preregistration, Hartung estimates in the report that some 68,000 chemicals will have to undergo toxicological testing to comply with REACH regulations.

The European Chemicals Agency, which oversees REACH compliance, responded to the report in a statement, saying, "Despite the unexpectedly large number of pre-registrations, the original estimates of the number of substances to be registered remain valid."

Richard A. Denison of the Environmental Defense Fund criticizes the report in a blog posting, writing that the authors "vastly overstate" the number of chemicals to be registered and tested under REACH.

Christopher Bryce, who monitors the European chemical industry for Marsh, a risk and insurance services firm, says the new report will surely "fan the flames" of animal-rights activity in Europe.—SARAH EVERTS

BIGSTOCK

Complying with REACH may require 54 million experimental animals.