By Stefan Andrei, Science Editor

Platinum-Gold Clusters Electrocatalysts Will Be Used for the Fuel Cells of the Electric Cars

Gold impedes platinum oxidation

Electric vehicles may seem something futuristic, but researchers see them as the best way of cutting off pollution and dependence on oil. Platinum has been found the most efficient electrocatalyst in fuel cells for electric vehicles. But in tests made with electric cars, however, the platinum dissolves, so practically can not be used; this is a major impediment for vehicle-application of fuel cells. But in a new test, adding gold clusters to the platinum electrocatalyst kept it intact during a stability test. "Fuel cells are expected to become a major source of clean energy, with particularly important applications in transportation," said Radoslav Adzic, from Chemistry Department of Department of Energy's Brookhaven National Laboratory, U.S."Despite many advances, however, existing fuel-cell technology still has drawbacks, including loss of platinum cathode electrocatalysts, which can be as much as 45 % over five days, as shown in our accelerated stability test under potential cycling conditions. Using a new technique that we developed to deposit gold atoms on platinum, our team was able to show promise in helping to resolve this problem. The next step is to duplicate results in real fuel cells." A hydrogen-oxygen fuel cell burns hydrogen with oxygen into water producing electricity. Electrocatalysts just speed up oxidation and reduction reactions. During the reaction, hydrogen releases electrons, which supply current for an electric motor. Oxygen takes electrons and combines with hydrogen, resulting water, the only byproduct of a fuel cell. The team replaced a single layer of copper with gold on carbon-supported platinum nanoparticles. Several sweeps of 1.2 volts turned the gold monolayer into three-dimensional clusters. X-rays, scanning transmission microscope, and electrochemical techniques revealed a reduced oxidation of platinum and the structure of the resulting gold-platinum electrocatalyst. The platinum electrocatalyst remained stable with potential cycling between 0.6 and 1.1 volts in over 30,000 oxidation-reduction cycles, like the conditions of stop-and-go driving. "The gold clusters protected the platinum from being oxidized," Adzic said. "Our team's research raises promising possibilities for synthesizing improved platinum-based catalysts and for stabilizing platinum and platinum-group metals under cycling oxidation/reduction conditions."