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Move Over Platinum

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Liming Dai, the University of Dayton's Wright Brothers Institute endowed chair in nanomaterials, and fellow scientists have taken a step toward a more efficient fuel cell that can be affordably mass-produced. They found that carbon nanotubes containing nitrogen are cheaper and work better than platinum in providing long-term fuel cell power.

Science Magazine will publish the findings Friday, Feb. 6.

Fuel cells convert hydrogen and oxygen to electrical power and water with no air pollution, hazardous waste or noise.

"Traditionally, fuel cells employ expensive platinum-based electrocatalysts, which cost about $4,000 for a passenger car," Dai said. "The goal is to reduce the major cost of a fuel cell in order to compete with current market technologies, including gasoline engines. Our finding is a major breakthrough toward commercialization of fuel cell technology for various applications."

Dai said those applications could someday include electric and hybrid vehicles, submarines that could operate silently underwater for weeks, airplanes powered by only a fuel cell and lightweight batteries, power plants, notebook computers, portable charging docks for electronics, and power-hogging smart phones with large displays and elaborate features like GPS.

"The importance of developing new types of energy is evident from the fact that global energy consumption has been accelerating at an alarming rate due to rapid economic expansion worldwide, increase in world population and ever-increasing human reliance on energy-based appliances," Dai said. "As we become more aware of 'greenhouse gases' and their detrimental effects on our planet, clean and renewable energy alternatives like fuel cells become more important than ever."

Dai also believes the role of nitrogen-doping, or adding nitrogen to carbon nanotubes, could be applied to the development of new materials for applications beyond fuel cells.

Michael Durstock in the Air Force Research Laboratory's Materials and Manufacturing Directorate, Zhenhai Xia in the University of Akron department of mechanical engineering, and Kuanping Gong and Feng Du in the University of Dayton departments of chemical and materials engineering contributed to the report. Dai also has joint appointment in the University of Dayton's chemistry department, the University of Dayton Research Institute and the Institute for Development Commercialization of Advanced Sensor Technology.

Dai has been a co-author of two Science articles since last October.

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