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Nanotechnology

Platinum Catalysts Branch Out

Dendritic structures outperform current fuel-cell materials

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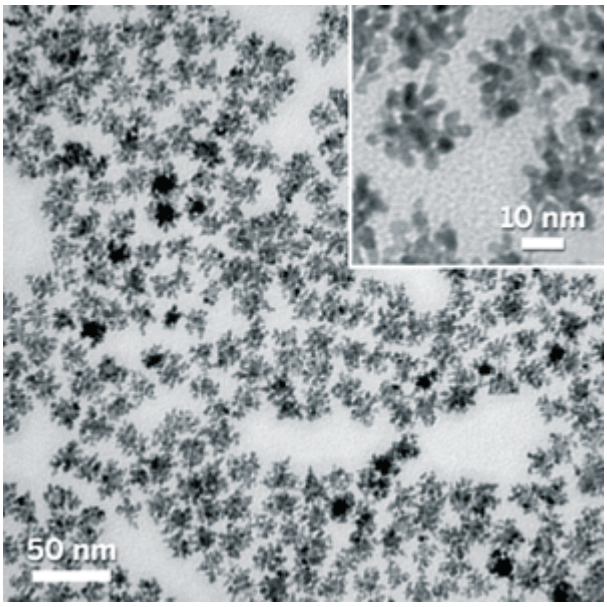
BY CAREFULLY CULTIVATING treelike nanostructures, scientists have created fuel-cell catalysts that are more than twice as active as state-of-the-art materials with the same mass (*Science*, DOI: 10.1126/science.1170377). The so-called bimetallic nanodendrites, which feature a palladium core surrounded by densely packed platinum branches, could lower the cost of fuel-cell-cathode materials, making the technology more viable for automotive applications.

The nanodendrites make superior catalysts because their branched structure creates a large surface area and maximizes the exposure of the Pt facets that are most active in the oxygen-reducing reaction that takes place in a fuel cell's cathode, according to Younan Xia, the engineering professor at Washington University in St. Louis who spearheaded the research. The treelike nanostructures are two-and-a-half times more active than the fine particles of Pt supported on porous carbon currently used in fuel-cell cathodes.

Xia's team creates the nanodendrites by reducing K_2PtCl_4 with L-ascorbic acid in the presence of faceted Pd nanocrystal seeds and a stabilizing polymer. "This synthetic protocol could be readily scaled up to become practical," Xia tells C&EN.

He also notes that the process is environmentally benign because it takes place in water without the need for high temperatures or electrochemical deposition. Xia and colleagues are working to improve the durability of the nanodendrites, which are currently only slightly more durable than commercial Pt-based catalysts.



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Nanodendrites with Pd cores and Pt branches are highly active fuel-cell catalysts.

The bimetallic nanodendrite catalysts represent "exciting progress in developing a new approach for effective usage of Pt for energy science," comments Zhong Lin Wang, a materials science professor at Georgia Tech. "The demand for Pt is growing each day. Therefore, searching for new catalysts to replace Pt or improving the effectiveness of Pt for catalysis is of vital importance for energy science and chemical technology," he says.

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