

Available Technologies

Platinum-Loading Reduction in PEM Fuel Cells

SUMMARY

Platinum, a costly precious metal element, is commonly used in fuel cells to facilitate the split of the hydrogen atom, which enables the membrane within a PEM (proton exchange membrane) fuel cell to generate a charge, and thus generate clean, direct current electricity. In PEM fuel cells, hydrogen at the anode generates electron and protons. The protons migrate through the proton-conducting membrane, and react with reduced oxygen at cathode to create water. Meanwhile, electrons move from anode to cathode to generate electric current and to reduce the oxygen at cathode.

Researchers at Pacific Northwest National Laboratory have developed a technology that supports the minimization of platinum use, thus reducing the cost of manufacturing PEM fuel cells by up to 1/3 without decreasing overall performance of the fuel cell. The oxygen reduction reaction (ORR) at the cathode is known to be a rate determining step for overall PEM fuel cell reactions, so it is critical to develop a low-Pt loaded catalyst, which can catalyze the ORR as well as a commercial, fully loaded Pt-carbon catalyst.

The technology involves the deposition of tantalum oxide nano particles on a carbon substrate where platinum nano particles are embedded in oxide particles. Using this approach, researchers have achieved identical performance for the oxygen reduction reaction with ~10% of the platinum loading compared to a commercial Pt/C catalyst.

Laboratory experiments have demonstrated this catalyst's performance is on par with traditional platinum-loaded catalysts, but a fraction of the cost.

ADVANTAGES

- * Reduces cost without decreasing performance of the fuel cell
- * Improves stability and life of the fuel cell

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- » [PNL Transportation Materials Website](http://energyenvironment.pnl.gov/research_areas/research_area_description.asp?id=215)

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Technology Portfolio(s)

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