# Atomic Layer-by-Layer Deposition of Platinum

**Core-shell nanostructures with platinum (Pt) overlayers on a nano-substrate core, formed of palladium (Pd) for core-shell nanostructures for use in electro catalytic applications**

Inventors at Georgia Tech have developed various embodiments of core-shell nanostructures having Pt overlayers on a nano-substrate core made of Pd and methods for the preparation of such core-shell nanostructures for use in electrocatalytic applications. The objective of the invention is to provide Pd@Pt core-shell nanostructures having conformal Pt overlayers on a Pd core, facile and scalable solution-based reaction methods and conditions for synthesizing such core-shell nanostructures, and use of the core-shell nanostructures as ORR catalysts on fuel cell cathodes. The Pd@Pt core-shell nanostructures synthesized according to the methods described possess a Pd nano-substrate core coated with one or more atomic overlayers of deposited Pt atoms.

**Summary Bullets**

- Increase the utilization efficiency of platinum
- Reduce the materials cost of fuel cells
- Enhancement for certain catalytic reactions

Solution Advantages

- Increase the utilization efficiency of platinum
- Reduce the materials cost of fuel cells
- Enhancement for certain catalytic reactions

Potential Commercial Applications

- Fuel cells
- Catalysts

Background and More Information

Depositing an ultrathin Pt shell on sustainable nano-substrates is an ideal strategy for improving the catalytic performance while reducing the content of Pt in a catalyst. Challenges and difficulties remain in the synthesis of core-shell nanostructures formed by deposition of layers of Pt on the surface of the nanoscale Pd substrates having precise control at the atomic scale. Development of such core-shell nanostructures can lead to efficient

oxygen reduction reaction (ORR) catalysts which can dramatically reduce the materials cost of fuel cells. There exists a need for Pt on Pd core-shell nanostructures having Pt overlayers with precisely and reliably controlled thicknesses, as well as development of novel methods of producing such core-shell nanostructures.

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**Publications**

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**Images**

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