Palladium Alloy Hydride Nano Materials

Tech ID: 24569 / UC Case 2014-904-0

SUMMARY

Researchers at UCLA have synthesized a range of intermetallic palladium hydride alloy (Pd/M-H) nanocrystals using a low cost solution process that avoids the use of surfactants and strong reducing agents.

BACKGROUND

Nanocrystalline intermetallics and alloys are novel materials with high surface areas which are potential low-cost and high-performance catalysts in oil refining, gas treatment, and polymerization of hydrocarbons. Nanocrystalline alloys of noble metals (e.g. palladium) with catalytically active metals (e.g. nickel, cobalt, or chromium) have the added advantage of using less of the expensive noble metal and having higher resistance to the poisoning of the catalyst. They are traditionally synthesized using high temperature metallurgical techniques that require either long annealing times, which often leads to non-nanocrystalline materials, or mechanical ball milling, which requires long milling times and leads to process contamination. Progress has been made in solution processing of nanocrystalline intermetallic alloys to address these concerns, but those techniques require both the use of surfactants that may lead to a decrease in catalytic activity and very strong reducing agents which are environmentally hazardous. The catalytically active hydride, (Pd/M)-H, has not been demonstrated before.

INNOVATION

Professor Duan and colleagues have devised a method for the synthesis of intermetallic palladium hydride alloy nanocrystals using a low-cost solution process that avoids the use of surfactants and strong reducing agents. Nanocrystalline intermetallics and alloys are novel materials with high surface areas which are potential low-cost and high-performance catalysts. In this technology, UCLA researchers developed a systematic approach to synthesize various palladium hydride alloys with nickel, cobalt, chromium, manganese, vanadium, and platinum. The approach is relatively low temperature, and avoids the use of harsh reducing agents or surfactants that may lead to a decrease in performance. These high surface area materials can be utilized as catalysts in petrochemical refining, exhaust gas treatment, or for organic synthesis reactions.

APPLICATIONS

- Catalyst for use in oil refining, gas treatment, and the polymerization of hydrocarbons
- Sensor for hydrogen gas

ADVANTAGES

- Higher catalytic activity
- Longer catalyst life
- Uses less noble metal which may decrease cost of catalyst
- Solution processing for high throughput synthesis
- Avoids the use of surfactants and strong reducing agents

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,307,746	06/04/2019	2014-904

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OTHER INFORMATION

KEYWORDS

Palladium hydride alloys, petrochemical refining, exhaust gas

CATEGORIZED AS

- **Environment**
  - Remediation
- **Materials & Chemicals**
  - Chemicals
  - Composites
  - Nanomaterials
- **Nanotechnology**
  - Materials
- **Engineering**
  - Other

RELATED CASES

2014-904-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Approaching Schottky-Mott Limit in Van Der Waals Metal Semiconductor Contacts
- Ultrafine Nanowires As Highly Efficient Electrocatalysts
- Chemical Vapor Deposition Growth of the Large Single Crystalline Domains of Monolayer and Bilayer
- Double-Negative-Index Ceramic Aerogels For Thermal Superinsulation
- Single-Atom Tailoring of Platinum Nanocatalysts for High-Performance Multifunctional Electrocatalysis
- High Performance Thin Films from Solution Processible Two-Dimensional Nanoplates

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