University of Central Florida

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Form Thermally Stable Nanoparticles on Supports

This invention provides methods and apparatus' for the synthesis and coating of size-selected thermally stable nanoparticles.

Background

Catalysts are compounds which speed up chemical syntheses and other types of reactions. Nanoparticles are especially good catalysts due to their small size and the concomitant increased surface area. Furthermore, size-dependent changes in the electronic properties of small nanoparticles and charge transfer phenomena at the interface between nanoparticles and certain supports might be used to tune their reactivity. Through the use of nanoscale catalysts, enhanced activities and selectivities for numerous chemical processes can be achieved. Unfortunately, the use of nanoparticles is restricted, because at high temperatures they experience sintering and/or changes in their shape (affecting the number of low-coordinated reactive sites) which reduce their catalytic performance. Another problem inherent to nanoparticle synthesis is the encapsulation of the particle by oxide supports. This encapsulation reduces the reactivity and therefore the function of the nanoparticles as a catalyst.

Technical Details

UCF researchers have discovered a new method for synthesizing size-selected nanoparticles. These nanoparticles are thermally stable, preserving their small size at high temperatures, which is important because the smaller particles are more active and selective, thereby more efficient catalysts. The potential to improve automotive catalytic converters and removal of NO_x from turbines is enormous. Micellar nanoparticles are reactive for several important reactions: CO oxidation, decomposition of ethanol, propanol and butanol for H_2 production, methanol oxidation for fuel cell applications, and the selective oxidation of high order alcohols for the synthesis of fine chemicals. Strong adhesion of these particles to nearly any surface means the catalyst can be used almost anywhere. These micellar nanoparticles also aid in the creation of nanowires, since they can be self-assembled on single crystal surfaces. These nanowires might function as highly efficient photocatalysts and sensors.

UCF Inventors

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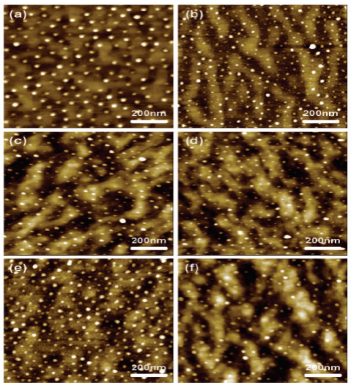

Nanoparticles including gold and iron synthesized by inverse micelle encapsulation

Benefits

- Enhanced thermal stability
- Produces nanoparticles with high reactivity due to the minimization of encapsulation by the oxide supports
- Large-scale, low-cost production

Applications

- High-temperature decomposition of sulfuric acid in hydrogen production
- Fuel cells

Tech Fields

Nanotechnology

Keywords

catalyst, nanoparticles, nanoscale catalyst, thermal stability, micellar

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