

The Economical Remediation of Plastic Waste into Advanced Materials with Coatings (IN-07-070)

Anodes for advanced batteries from a readily-available substance

The Invention

Argonne has developed an autogenic pyrolysis process to convert plastic waste into high-value carbon nanotubes (50-100 nm outside diameter) and perfectly round carbon spheres (2-12 μm outside diameter). The tubes can be used as anode material in advanced batteries such as lithium-ion and eventually, lithium-air batteries.

The process involves thermally decomposition of plastic waste at 700°C in a closed volume reactor. Only a small amount of catalyst is needed to grow carbon nanotubes. The process is environmentally friendly, solvent-less, reproducible, affordable, and scalable.

A major and significant advance is the ability to coat carbon nanoparticles with other materials or other materials with carbon. A number of materials have been used to coat the carbon nanoparticles including, but not limited to titanium oxide, vanadium oxide, alumina, zirconium, copper, tin, silicon, and other materials. A number of materials where carbon can be a core or shell of the composites could be prepared using this technique (Figure 1).

In a world where polyethylene-based automobile parts, food packaging materials, toys, milk bottles, as well as polystyrene-based plates, cups and packaging materials comprise a major energy and environmental burden that ends up polluting the land and oceans, or as wasted resources placed in landfills, Argonne's invention is an elegant answer to both an environmental and a technological need.

Benefits

- ▶ Environmentally friendly
- ▶ Solvent-less
- ▶ Reproducible
- ▶ Affordable
- ▶ Scalable

Applications and Industries

- ▶ Anodes for lithium-ion and lithium-air batteries

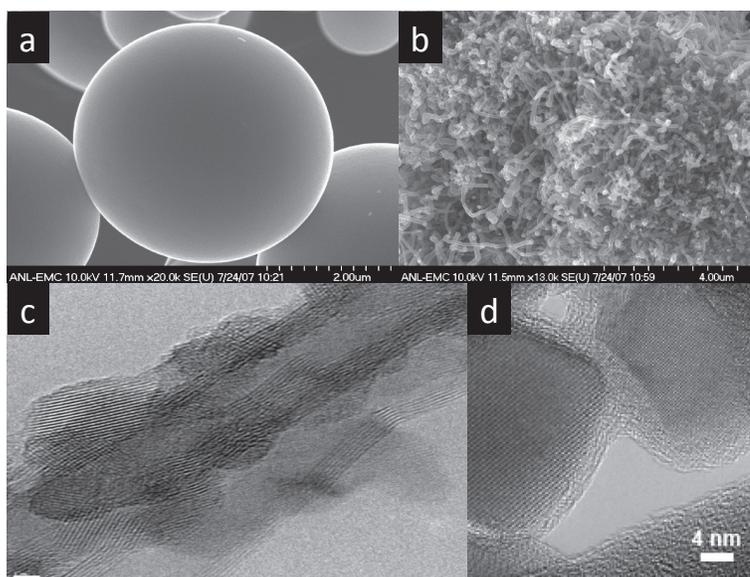


Figure 1. A) As-prepared carbon sphere, B) carbon nanotubes, C) nanosized titanium oxide coated on carbon nanotubes and D) carbon coated TiO_2 nanoparticles.

Developmental Stage

Reduced-to-practice. The carbon particles are being tested in a number of applications.

Availability

Available for licensing

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Patent Information

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