

Non-Confidential Description - PSU No. 0648
"Nanoparticle and Nanotube Production by a Novel Laser-Liquid-Solid Interaction Technique"

Keywords:

Nanotechnology – Nanoparticles, Fabrication, Manufacturing

Links:

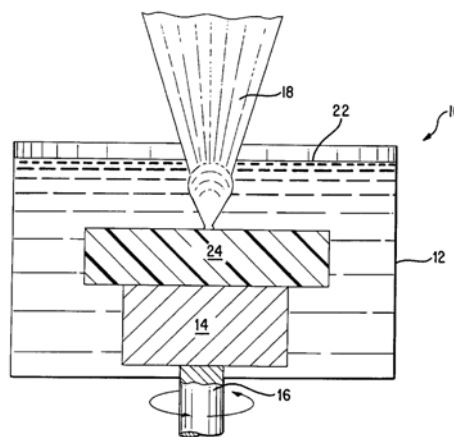
[US Patent 6,068,800](#)

[US Patent 5,770,126](#)

[Inventor Website](#)

Inventors:

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Background

Nanoparticles are used in many biomedical, catalytic, magnetic, electronic, and structural applications. Conventional methods for producing nanoparticles include mechanical milling, spray pyrolysis, chemical precipitation, and vapor-phase synthesis. These methods are hindered by contaminants, agglomeration, poor control of particle size and morphology, and hazardous chemical wastes.

Invention Description

The disclosed invention describes a method for the production of nanoparticles that avoids many of the complications faced by other methods. This method uses a pulsed or continuous laser to locally heat a metallic substrate that is immersed in a specialized liquid precursor. A single, high-powered (~300 W) laser and beam splitters are used to heat the substrate. The resulting laser-liquid-solid interaction forms a plasma that atomizes into ultrafine elemental powders, viz. nanoparticles and nanotubes. The parameters of the method have been tailored to produce nanoparticles of silver, nickel, and immiscible alloys of the two; as well as oxides of metals such as silver, cobalt, iron, and vanadium.

Advantages/Applications

- Ability to tailor particle diameter and material composition
- Synthesis rates upwards of 3 grams/hour
- Process appears scalable, but development is required

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