BORONATED NANOSCALE SUBSTATE AND USES THEREOF

Method for grafting boron shells onto diamond nanoparticles, enabling targeted boron neutron capture therapy (BNCT) for brain cancer treatment with improved stability, tumor retention, and scalability, with potential applications in personalized cancer treatment.

Case ID:
ID2021-018

IP Position:
Patent Pending

Development Status:
TRL 3: Concept demonstrated on lab platform - analytical models to support lab design

Opportunity
Partners sought for development and prototype testing.

Category(s):
Boron Neutron Capture Therapy (BNCT), Nanodiamonds (NDs), Boron-coated Nanodiamonds

Keywords:
Cancer Therapy, Nanotechnology, Nanoparticles, Personalized Medicine

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Description

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SJSU RESEARCH AND INNOVATION

Technology Overview

A novel method for grafting boron shells onto diamond nanoparticles, resulting in boron-coated diamond nanoparticles (ND-B). The process is cost-effective, scalable, and performed at room temperature using reactive boron precursors. ND-B nanoparticles have the potential to revolutionize targeted boron neutron capture therapy (BNCT) for the treatment of brain cancers like glioblastomas.

Unlike existing BNCT materials, ND-B nanoparticles offer improved stability, tumor retention, and flexibility in size and morphology. The technology also allows for liposome encapsulation of ND-B nanoparticles, expanding their applications in BNCT. Additionally, this technology has broader implications beyond BNCT, with potential applications in insecticides, fuel additives, anti-corrosive agents, and fuel cells.

Key Features & Benefits

- **Innovative Method:** A wet chemical synthetic method that operates at room temperature, making it more accessible and less energy-intensive than other methods.
- **Scalability and Cost-Effectiveness:** Process uses low-cost reagents and is scalable, making it a cost-effective solution for large-scale production, a significant improvement over traditional methods, which are expensive, toxic, and non-scalable.
- **Versatility:** ND-B can be used as delivery vectors for boron-10 into glioblastomas for targeted BNCT. Improved stability, tumor retention, and flexibility in size and morphology compared to existing BNCT materials.

Potential Applications

- Personalized cancer treatment by adjusting the size and morphology of ND-B nanoparticles to tailor the therapy to individual tumors.
- Targeted BNCT for the treatment of brain cancers like glioblastomas, utilizing the ND-B as delivery vectors for boron-10.
- Insecticides, where the ND-B nanoparticles can be utilized as an effective insecticide agent.
- Versatile applications in fields like fuel additives, anti-corrosive agents, and fuel cells, leveraging the unique properties of ND-B nanoparticles.

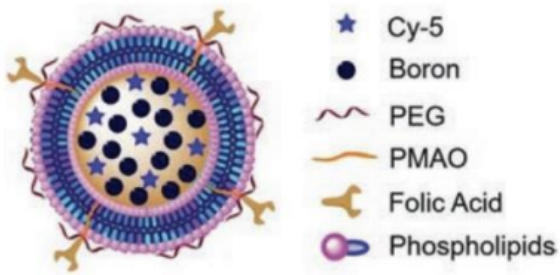

Fig 1.

Schematic diagram of Boron nanoparticles encapsulated in a liposomal structure and functionalized at the surface with different ligands. Blue indicates the hydrophobic tails of the phospholipid while the pink indicates the polar head.