

Patent Application: Diamond Composites (Hemp-Based Nanomaterial)

Abstract

This invention relates to a novel class of fully biodegradable, high-strength hemp-based nanocomposite materials, nicknamed 'Diamond Composites,' designed for advanced applications, including ballistic protection, aerospace, and energy storage. The composition incorporates hemp-derived carbon nanosheets, hemp oil, lignin, fiber, hurd, and other hemp plant components, engineered for superior strength, conductivity, and sustainability.

Background and Prior Art

Current synthetic composite materials, including Kevlar, carbon fiber, and graphene-epoxy composites, provide exceptional strength but are expensive, environmentally damaging, and difficult to recycle. 'Diamond Composites' aim to replace these materials with a fully sustainable, hemp-based alternative, offering comparable or superior mechanical and electrical properties while remaining cost-effective and biodegradable.

Summary of the Invention

'Diamond Composites' consist of:

- Hemp Carbon Nanosheets: High electrical conductivity and tensile strength.
- Hemp Oil-Based Resin: Biodegradable, cross-linkable matrix for self-healing properties.
- Lignin: Thermal resistance and toughness enhancer.
- Hemp Fibers: Improves mechanical strength and flexibility.
- Hemp Hurd: Lightweight filler for impact resistance.
- Plant Waste (Flowers, Seeds, Press Residue): Additional functional bio-components.

This composite is designed to be used in defense, aerospace, automotive, and energy applications where high performance and sustainability are required.

Claims

1. A fully biodegradable hemp-based nanocomposite material consisting of hemp-derived carbon nanosheets, hemp oil, lignin, hemp fiber, hemp hurd, and additional hemp plant components.
2. A composite material with high tensile strength and impact resistance, suitable for use in ballistic protection.
3. A lightweight, high-conductivity material suitable for electromagnetic shielding and energy storage applications.
4. A self-healing nanocomposite using hemp oil as a cross-linking polymer.
5. A method of manufacturing the composite material, involving carbonization, polymerization, and

layering techniques.

Manufacturing Process

1. Carbonization: Hemp fibers, hurd, and lignin are pyrolyzed to produce carbon nanosheets.
2. Resin Formation: Hemp oil is processed into a polymerizable resin with cross-linking agents.
3. Fiber Integration: Hemp fibers are layered within the composite for reinforcement.
4. Composite Layering: Multiple layers of nanosheets, fibers, and resin are structured for impact resistance.
5. Heat Treatment: The material undergoes controlled curing to enhance mechanical properties.
6. Final Processing: The composite is cut and molded for specific applications.

Applications

- Ballistic armor plates and military vehicle reinforcement.
- Lightweight structural panels for aerospace and automotive sectors.
- Conductive nanomaterials for electromagnetic shielding.
- Sustainable, fire-resistant construction materials.
- Supercapacitor and energy storage materials based on hemp-derived carbon.