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Method and Composition for Producing Diamond Composites Derived from Hemp Nanosheets, Hemp Oil, and Hemp Lignin (Patent Pending)

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Title: Method and Composition for Producing Diamond Composites Derived from Hemp Nanosheets, Hemp Oil, and Hemp Lignin (Patent Pending)

Field of the Invention

The present invention relates to the field of advanced composite materials, specifically to a novel class of sustainable, high-performance composites derived from hemp nanosheets, hemp oil, and hemp lignin. These materials, referred to as Diamond Composites, exhibit exceptional mechanical properties, environmental sustainability, and versatility for applications in industries such as aerospace, automotive, construction, and renewable energy.

Background of the Invention

Traditional composites rely on synthetic resins and carbon-based reinforcements derived from non-renewable resources, which contribute to environmental degradation. Recent advancements in sustainable materials science have demonstrated the potential of bio-derived components in creating high-performance composites. Hemp nanosheets, hemp oil, and hemp lignin offer unique synergistic properties:

1. **Hemp Nanosheets:** Graphene-like carbon nanosheets derived from hemp fibers, characterized by their high strength, electrical conductivity, and thermal stability.
2. **Hemp Oil:** A plant-based oil that serves as a matrix or resin component, offering renewable and biodegradable properties.
3. **Hemp Lignin:** A natural polymer from hemp biomass that acts as a curing agent, enhancing crosslinking and the mechanical integrity of the composite.

This invention leverages these components to produce Diamond Composites with superior environmental and mechanical performance.

Summary of the Invention

The invention provides a method and composition for producing Diamond Composites using a triform of hemp-derived materials: hemp nanosheets, hemp oil, and hemp lignin. The method includes the preparation of each component, their integration into a composite matrix, and a curing process to achieve the final material. The resulting Diamond Composites exhibit high tensile strength, low density, and excellent resistance to environmental degradation.

Detailed Description of the Invention

1. Components

1.1 Hemp Nanosheets

- Prepared from hemp fibers through a chemical or thermal exfoliation process.
- Characterized by a high surface area, excellent mechanical strength, and thermal stability.

1.2 Hemp Oil

- Extracted from hemp seeds or biomass.
- Modified chemically or thermally to optimize resin properties, such as viscosity and crosslinking capability.

1.3 Hemp Lignin

- Isolated from hemp biomass through chemical or enzymatic methods.
- Acts as a curing agent, enhancing the crosslink density and stability of the composite.

2. Preparation Process

2.1 Mixing

- The hemp nanosheets are dispersed in hemp oil using ultrasonic mixing or high-shear blending to achieve a homogeneous mixture.

2.2 Addition of Hemp Lignin

- Hemp lignin is introduced to the mixture and stirred at elevated temperatures to initiate the curing process.

2.3 Forming

- The mixture is poured into molds or applied as layers, depending on the desired shape and application.

2.4 Curing

- The material is cured under controlled conditions of temperature and pressure to achieve full polymerization and crosslinking. Typical curing conditions range from 100°C to 150°C for 2-6 hours.

3. Properties of Diamond Composites

- **Mechanical Strength:** Tensile strength exceeding traditional carbon-fiber composites.
- **Thermal Stability:** Operates effectively in a wide temperature range (-50°C to 250°C).
- **Environmental Sustainability:** Fully biodegradable and sourced from renewable resources.

Claims

Claim 1: A composite material comprising hemp nanosheets, hemp oil, and hemp lignin, wherein the hemp nanosheets act as a reinforcement, the hemp oil serves as a matrix, and the hemp lignin functions as a curing agent.

Claim 2: A method of producing a composite material, the method comprising:

- Dispersing hemp nanosheets in hemp oil;
- Adding hemp lignin to the mixture;
- Curing the mixture under controlled temperature and pressure conditions to form a solid composite.

Claim 3: The composite material of Claim 1, wherein the hemp nanosheets are prepared through a chemical exfoliation process to achieve a graphene-like structure.

Claim 4: The composite material of Claim 1, wherein the hemp oil is chemically modified to optimize its viscosity and crosslinking properties.

Claim 5: The composite material of Claim 1, wherein the hemp lignin is derived from hemp biomass through enzymatic isolation.

Abstract

A sustainable, high-performance composite material derived from hemp nanosheets, hemp oil, and hemp lignin is disclosed. This novel Diamond Composite material is characterized by its exceptional mechanical strength, thermal stability, and biodegradability. The invention includes the method of preparing and curing the composite, with potential applications in aerospace, automotive, construction, and renewable energy industries.

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