

Seshat’s 100% Organic Hemp Bionanocomposites: Theoretical Foundations and Research Trajectory

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Abstract

This document summarizes ongoing theoretical research into the development of 100% organic “Diamond Composites”—bionanocomposites derived entirely from hemp resources. These materials integrate hemp-derived carbon nanosheets (HDCNS) into a hemp-based bio-epoxy matrix. This emerging class of sustainable nanocomposites has the potential to outperform petroleum-based alternatives while promoting regenerative agriculture, carbon sequestration, and circular economies.

1 Introduction

The **Diamond Composites** concept proposes the fabrication of high-performance bionanocomposites using exclusively hemp-derived raw materials:

- Hemp-derived carbon nanosheets (HDCNS), synthesized from pyrolyzed hemp biomass.
- Bio-epoxy matrices created from hemp seed oil epoxidation and lignin extracted from hemp stalks.

These composites aim to bridge the performance gap between synthetic composites (e.g., fossil-oil epoxies reinforced with graphene) and sustainable material solutions, emphasizing a fully regenerative lifecycle.

2 Research Milestones

2.1 Preprint Publications

The following preprints by Marie Seshat Landry have outlined the theoretical basis for Diamond Composites:

- **Introducing HDCNS-Composites: A Novel Class of Materials**
DOI: 10.5281/zenodo.15084103
This foundational paper theorizes the integration of hemp-derived carbon nanosheets into polymer matrices, establishing the core idea of HDCNS-composites.
- **Seshat’s 100% Organic Hemp Bionanocomposites (Diamond Composites)**
DOI: 10.5281/zenodo.15091234
A formal proposal defining Diamond Composites, highlighting fully organic synthesis pathways and potential material properties such as high tensile strength, thermal stability, and biodegradability.

- **A Comprehensive Framework and Call for Collaborative Validation**

DOI: 10.5281/zenodo.15164887

This paper expands upon applications, outlines a strategic vision for prototype development, and calls for interdisciplinary collaboration.

3 Related Prior Art and Context

The Diamond Composites concept builds upon and extends previous work in sustainable nanomaterials:

- **Hemp-Derived Graphene** — Techniques for synthesizing graphene-like materials from hemp biomass were pioneered by *David Mitlin et al.* (2014) [1].
- **Bio-Based Epoxy Resins** — Research into epoxidized vegetable oils, including hemp seed oil, as renewable epoxy precursors is well-established [2].
- **Natural Fiber Composites** — Reinforcement of bio-based composites using natural fibers (e.g., flax, jute, hemp) is a mature area of study [3].

4 Future Directions

- Experimental synthesis and characterization of HDCNS and hemp-based bio-epoxies.
- Mechanical, thermal, and environmental testing of Diamond Composite prototypes.
- Scaling production for applications in automotive, aerospace, and construction sectors.
- Exploration of lunar and Martian infrastructure using hemp-based composites for regenerative space habitats.

5 Conclusion

Diamond Composites offer a transformative opportunity to lead the next wave of sustainable material innovation. By leveraging the biological advantages of hemp, these composites could set new standards for performance, environmental impact, and ethical technology.

References

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