

Prototyping Roadmap for Seshat's Composites Phase1 – Blobs

Marie Seshat Landry

May 24, 2025

Abstract

Phase1 of Seshat's Composites builds and tests “blobs” of hemp carbon (HEMPALTA Biochar+) in hemp oil to validate hypotheses on maximum solidity and conductivity. This concise roadmap covers materials, a guiding principle, core protocol, key tests, and a four-week timeline—kept under CAD\$200 for core equipment.

Statement of Novelty

Seshat's Composites are the first open-source, programmable bioresins formed by blending hemp-derived carbon into hemp oil. Phase1 uses HEMPALTA Biochar+ to prove that near-maximum carbon loading yields both high hardness and conductivity without synthetic additives.

Guiding Principle

“Mix the maximum amount of hemp carbon into hemp oil until the paste is barely pourable, then cure under mild heat and pressure.”

Objective

- Create the densest, hardest blob by pushing carbon loading to its workable limit.
- Lock in density and conductivity via pressure-assisted curing.
- Generate data to validate models of carbon percolation and structure–property relationships.

Materials & Budget

Item	Source & Link		Cost
HEMPALTA (7.6L)	Biochar+	Amazon.ca: HEMPALTA Biochar+	\$34.95
Organic Hemp Oil (2×500mL)		Corn Crib Natural Foods (Moncton) — corncribhealth.com	\$35.00
Silicone Molds (10mL, 12pcs)		Amazon or craft store	\$15.00
Drill Mixer Bit		Hardware store/Amazon	\$10.00
Precision Scale (0–10kg)		Amazon/lab supplier	\$20.00
Multimeter		Electronics supplier	\$25.00
Clamp Press (1–2kg)		Hardware store	\$20.00
Copper Wire & Clips		Electrical supplier/Amazon	\$5.00
Subtotal			\$165.95

Optional Upgrades (if budget allows):

- Desktop vacuum degasser (\$60) – for improved void removal.
- Higher-precision force gauge (\$80) – for detailed mechanical curves.

Formulations

Prepare these six blobs (by weight):

Blob	Carbon (%)	Oil (%)
A	50	50
B	60	40
C	70	30
D	80	20
E	90	10
F	95	5

Core Protocol

Week1: Setup

1. Lay out 12 identical 10mL molds.
2. Create spreadsheet with columns: Blob, Carbon%, Oil%, Wet Mass, Cured Mass, Diameter, Compression (N), Resistance (), Water Uptake (%).

Week2: Mixing, Molding & Curing

For each Blob A–F:

1. **Weigh** carbon + oil (e.g. 9.5g + 0.5g for F).
2. **Hand-mix** 30s; **drill-mix** 60s on low.

3. **Degas:** zip-lock+straw hack or optional vacuum.
4. **Mold & press:** fill mold, apply clamp (1–2kg) continuously.
5. **Record** wet mass diameter.
6. **Cure:** 12h at room temperature under clamp, then 80°C for 4h under clamp.
7. **Cool & demold:** 2h under clamp + 1h free; record cured mass diameter.

Testing (Week3)

1. **Drop Test:** 30cm drop, pass/fail.
2. **Compression:** measure peak force (N) with scale plunger.
3. **Conductivity:** measure resistance () 1cm apart.
4. **Water Uptake:** soak 30min, compute $\frac{\Delta m}{m_{\text{dry}}} \times 100\%$.

Data Analysis & Future Work (Week4)

- Plot Compression vs. Resistance; compute correlation.
- Rank by combined solidity–conductivity score; select top 3.
- **Future Work:** Test additional hemp carbon allotropes (nanosheets, activated carbon), refine ratios, and expand to energy-storage or structural applications.
- Publish protocols data on Zenodo/Scribd to establish prior art.

Safety

- Work in a ventilated area during oven cure.
- Monitor temperature; avoid overheating.
- Wear gloves goggles when mixing and handling hot molds.