Structural Biobased Composites

design, development, durability

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Outline

Meet The Team Leaders
Envisioned Closed-Loop Lifecycle
My Role: Structural Engineering
Meet the Rest of the Team
Meet the Team Leaders

INTERDISCIPLINARY TEAM
@ STANFORD

CRAIG CRIDDLE
Environmental Engineering

CURTIS FRANK
Chemical Engineering

SARAH BILLINGTON
Structural Engineering

Microbiology
Wastewater

Polymer Chemistry
Polymer Interface

Materials Testing
Cement-Based Composites

biobased composites
Envisioned Closed-Loop Lifecycle

**genesis + manufacture**

- **pha biopolymer:**
  - harvested from bacteria
  - anaerobically biodegrades rapidly
  - good mechanical properties
  - melt properties good for composite processing

- **carbon-source feedstock:**
  - sugars (glucose, sucrose) typically from corn
  - methane CH₄
Envisioned Closed-Loop Lifecycle

**genesis + manufacture**

- true biobased composite
- natural fibers
- pha

**natural fibers:**
- low cost availability
- biodegradability
- stiffness / strength
- waste product

flour fabric
Envisioned Closed-Loop Lifecycle

application + use

genesis + manufacture

ttrue biobased composite

natural fibers

+ pha

sandwich panels
trim / finishes
formwork
deking
framing

flour fabric

1μm
Envisioned Closed-Loop Lifecycle

 genesis + manufacture

 true biobased composite

 II

 natural fibers

 +

 pha

 application + use

 sandwich panels trim / finishes formwork decking framing

 anaerobic degradation + biotransformation

 biogas methane capture

 flour fabric

 1µm
My Role: Structural Engineering

- Composite fabrication
- Materials testing
- Material durability testing

- Wood-Plastic Composites
- Mechanical properties → target applications
- Water absorption reduces mechanical properties
- UV weathering: color change & embrittlement
Meet the Rest of the Team

genesis + manufacture

application + use

degradation + biotransformation
Questions?

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