

# Discovery of C-lignin shows promise as feedstock for carbon fiber

## Background

Previous research reported in a joint publication from BESC and GLBRC revealed the existence of high concentrations of a unique form of lignin polymer, C- or poly Caffeyl Alcohol-Lignin, in Vanilla bean seed coats and suggested that this form of lignin may have beneficial properties for carbon fiber .

## Approach

Pure C-Lignin was prepared from ground seed coats of *Vanilla planifolia* and its electrospinning properties were compared with that of conventional Kraft lignin extracted from the black liquor residue produced from pulp and paper production. Conventional Kraft lignin is a mixture of lignin components.

## Outcomes

- Carbon Fiber produced from purified C-lignin showed substantial improvements in quality over that produced from Kraft Lignin, including:
  - More continuous fiber
  - More even fiber size distribution
  - Smoother fiber properties (reduced breakage)

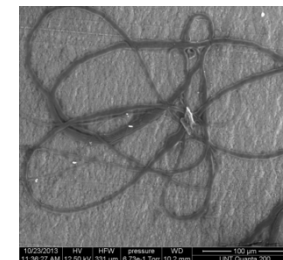
## Significance

The higher purity of C-lignin over Kraft fibers and PAN-based fibers is expected to translate into higher mechanical stiffness, thermal and electrical conductivity.

This work is now the basis of a provisional patent application.

### Notes

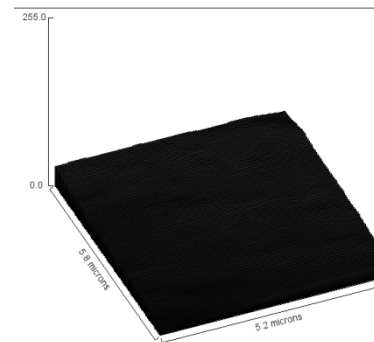
- This discovery grew from a collaborative BESC-GLBRC paper and 2012 highlight (see slide 2).
- It was identified as of potential interest in carbon fibers by applied scientists at ORNL and developed in internally funded collaborations at University of North Texas.



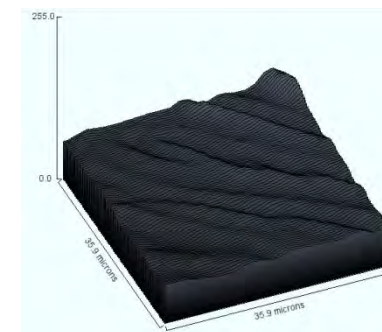
Carbon fiber spun from C-lignin



Crude C-lignin preparation



Fiber from C-lignin



Fiber from Kraft-lignin

Data from M. Nar and N. D'Souza,  
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