

Automotive Lightweighting Materials

Low-Cost Carbon Fiber from Renewable Resources

Background

High-volume, renewable sources of carbon fiber feedstocks are needed to permit widespread use of carbon fiber composites in automobiles. Low-cost, high-volume sources for carbon fiber would permit automobile manufacturers to use more than a million tons of composites per year. Replacing half the ferrous metals in current automobiles would greatly reduce weight, emissions, and fuel consumption. Oak Ridge National Laboratory (ORNL) is conducting research into low-cost, renewable sources for production of carbon fiber, in coordination with the Automotive Composites Consortium, an R&D partnership between Ford, General Motors, and DaimlerChrysler.

The Technology

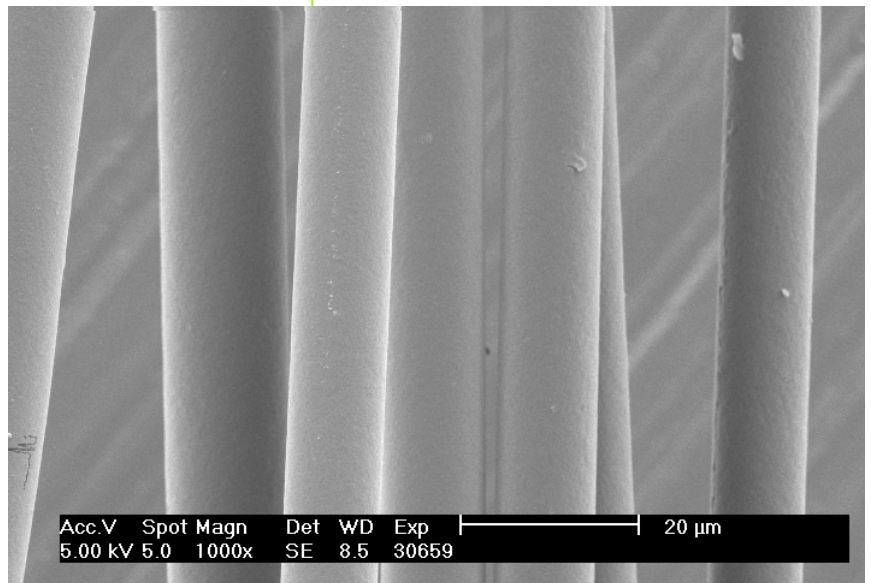
Conventional carbon fibers are produced from two petrochemical materials—pitch and polyacrylonitrile (PAN). Alternative feedstocks for carbon fibers—lignin from pulp mills, recycled plastics, and cellulose—were evaluated using small amounts of melt-spun single fibers. More than 40 different blends of fiber were

spun, furnaced, and tested. Multiple fibers in the size range needed for automotive composites are being melt-spun from a blend of pulp-mill lignin and recycled plastic. The raw fibers are spun at the University of Tennessee, and then graphitized and evaluated at ORNL. Initial evaluations indicate that the carbon fiber would probably meet automotive cost and performance requirements.

The technology for producing these fibers in conventional industrial equipment is being developed. Tests using a research line at a nearby carbon fiber production facility are planned.



Less dependence on foreign oil, and eventual transition to an emissions-free, petroleum-free vehicle



Scanning electron micrograph of carbon fibers made from multifilament melt-spun lignin blend feedstock.

Commercialization

The goal of this research is the development of technology which permits the manufacture of low-cost carbon fibers suitable for use in cars from a feedstock made of lignin and recycled plastic. Sufficient lignin and recycled plastic are available to meet the automotive market need.

Development of this technology involves optimization of starting materials, spinning dies, fiber handling, and sizing, as well as evaluations of carbon fiber production on industrial research lines. The technology will be transferred to producers in the carbon fiber and forest products industries.

Benefits

- Environmentally friendly—melt spun fiber derived from waste and recycled plastics
- Lower cost and higher production will enhance use of composites in automobiles, resulting in
 - reduced vehicle weight, emissions, and fuel consumption;
 - increased range; and
 - reduced greenhouse gases.

Where Can I Find More Information?

C. David Warren
Oak Ridge National Laboratory
865-574-9693
warrencd@ornl.gov

DOE Technology Manager
Dr. Joe Carpenter
Department of Energy
202-586-1022
joseph.carpenter@ee.doe.gov

A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.



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