Our expertise in materials science, advanced fibers, and composites is leading to innovative technology that can then be transferred to industry partners to increase US competitiveness in manufacturing.

Merlin Theodore, Advanced Fibers Manufacturing Group Leader
Recent Impacts

**Powder bed advancement**—Fabricated industrial gas turbine airfoil without surface cracks with electron beam powder bed additive manufacturing; developed data framework containing both modeling and real-time data acquisition to recognize variations and defects in a broad range of powder bed additive manufacturing technologies

**Machining integration**—Developed a hybrid machine and 3D-printed a mold for a machine tool’s base with the concrete-filled polymer mold offering a superior alternative to traditional metal castings

**New materials**—Deposited additively manufactured steel tooling to make fiber-reinforced polymer composites; deposited aluminum–cerium additively manufactured alloys with higher performance than conventionally manufactured, aerospace-grade aluminum alloys

**Large-scale applications**—Developed a commercially available large-scale thermoset additive manufacturing system and commercially available thermoset materials; demonstrated the ability to manufacture large additively manufactured metallic structures with multiple materials and out-of-plane deposition for complex components; designed and fabricated an infrastructure-scale concrete deposition system for energy generation applications

**Industry collaborations**—Developed tooling, molds, and materials and transferred technology to industry for the mass production of face masks, test tubes, shields, and N95 material in the fight against COVID-19

Unique Facilities

*The Manufacturing Demonstration Facility (MDF) houses integrated capabilities that drive the development of new materials, software, and systems for various advanced manufacturing technologies. The MDF leverages a range of equipment and expertise designed to deliver results that generate energy efficiency improvements in the manufacturing sector, efficiently use domestic energy resources, and support the secure production of clean energy products.*

*The Carbon Fiber Technology Facility (CFTF) provides a platform for evaluating new processing technologies and identifying high-potential, low-cost raw materials including textile, lignin, polymer, and hydrocarbon-based precursors. With the CFTF capabilities, ORNL is developing low-cost carbon fiber materials with desired structural properties and co-optimizing feedstocks and processing conditions. The CFTF is also exploring revolutionary ways to produce low-cost silicon carbide fiber, which is key for many high-temperature applications that ultimately increase energy efficiency.*