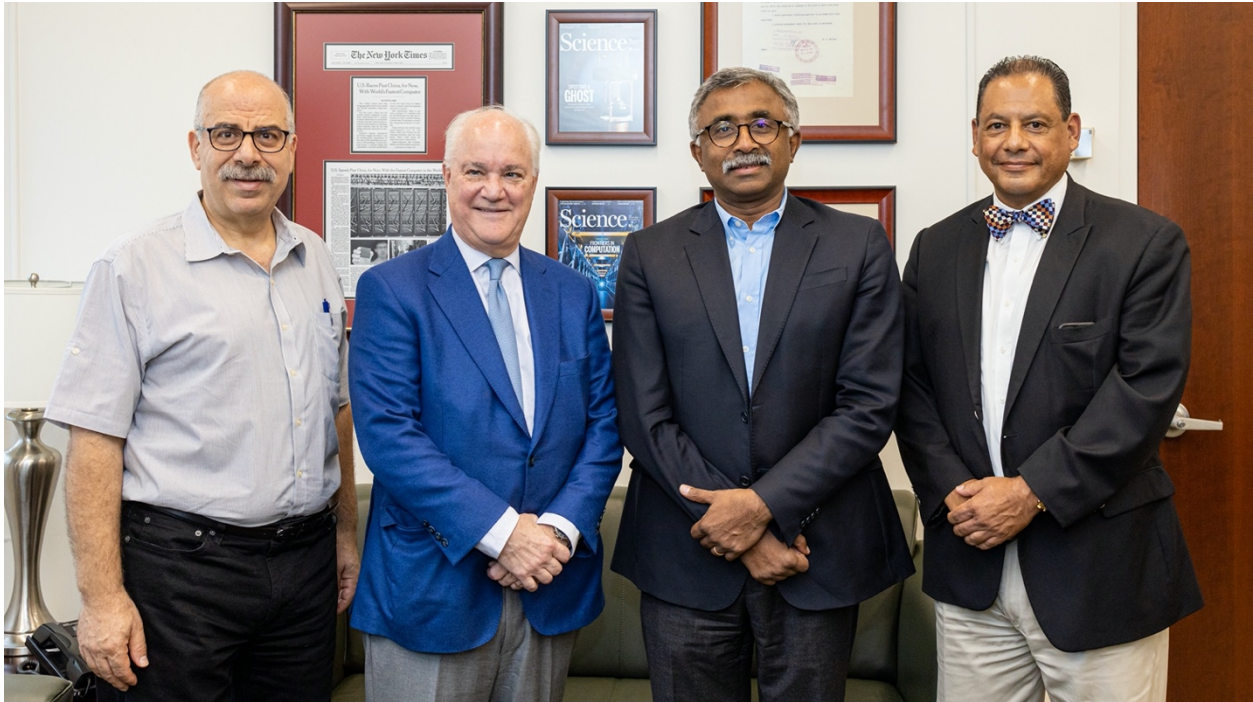




Ramaco Carbon Forms Coal-to-Products Partnership with Oak Ridge National Laboratory, U.S. Department of Energy's Largest Science and Energy Laboratory



Caption: At Oak Ridge National Laboratory during an executive visit by Ramaco Carbon in September 2019. Pictured L-R: ORNL Deputy for Projects Moe Khaleel, Ramaco Carbon Chairman and CEO Randall Atkins, ORNL Laboratory Director Thomas Zacharia, and Co-Director of ORNL's Fossil Energy Program Edgar Lara-Curzio. **Photo credit:** Carlos Jones, Oak Ridge National Laboratory/U.S. Dept. of Energy.

FOR IMMEDIATE RELEASE

June 2, 2020

SHERIDAN, WY — Carbon technology firm Ramaco Carbon today announced it has entered into a partnership with Oak Ridge National Laboratory (ORNL), the nation's largest U.S. Department of Energy (DOE) science and energy laboratory, to explore innovations for the conversion of coal to high-value advanced carbon products and materials.

The five-year umbrella cooperative research and development agreement (CRADA) will allow ORNL and Ramaco Carbon to work together on new projects that use coal as a manufacturing feedstock for carbon fibers, building products and composites, as well as electrodes for energy



storage devices and new materials for additive manufacturing, including large-scale 3D printing. The research will be funded by DOE's Office of Fossil Energy and Ramaco Carbon. Previously, Ramaco Carbon and ORNL collaborated on related research under separate agreements for nearly four years.

The agreement brings together ORNL's chemical and materials science and engineering, computational science and advanced manufacturing expertise with Ramaco Carbon's coal-based research, manufacturing and 3D printing facilities being developed near Sheridan, Wyoming.

Ramaco Carbon's interest in the development of coal to products aligns with areas in which ORNL has extensive expertise and background. ORNL is also home to the Carbon Fiber Technology Facility, DOE's only designated user facility dedicated to carbon fiber innovation, with a customizable platform that validates new conversion technologies at semi-production scale.

"We are deeply honored to be partnered with the DOE's leading innovator in advanced carbon materials and additive manufacturing," said Ramaco Carbon Chairman and CEO Randall Atkins. "We're proud to have built our relationship with ORNL's world-class team over the past several years, and are now excited to form a more direct partnership. We look forward to working alongside them to develop cutting-edge research into how we can utilize our nation's most abundant resource — coal — to manufacture and commercialize high value advanced products and new carbon materials. We hope that by working with ORNL and the other national labs, we can create novel ways to use coal to both stimulate the economy and help ensure our national security."

"ORNL is pleased to work with Ramaco Carbon to push the boundaries of what is possible with our science and technology capabilities to support coal to products breakthroughs," said ORNL Deputy for Projects Moe Khaleel. "Oak Ridge has a rich history of scientific research and facilities supporting the nation's exploration, production, and use of abundant, domestic fossil energy, and we look forward to continuing our mission in this area."

Ramaco Carbon also entered into a similar CRADA agreement in 2018 with the National Energy Technology Laboratory (NETL). Ramaco's work with NETL has involved the use of coal to make graphene, carbon nanotubes, and to recover rare earth minerals. Ramaco Carbon is also a party to five current DOE grants in the coal to products field.

Since 2014, Ramaco Carbon has pioneered the concept of creating a "Carbon Valley" in which coal's low-cost carbon, together with new research and modern manufacturing techniques, can synergistically be used to develop advanced carbon products and materials.



Ramaco Carbon is a carbon technology company, based in Sheridan, Wyoming, with operations in both Wyoming and West Virginia. It has focused on the use of coal to create advanced carbon products and materials, such as carbon fibers, building products, rare earth minerals, graphene-based medical devices and other life science products. The company is building the nation's first vertically integrated carbon tech platform, which includes Ramaco's coal mine in Wyoming, the iCAM (Carbon Advanced Materials) research park campuses in Wyoming and West Virginia, and future iPark mine-mouth manufacturing facilities. Visit www.ramacocarbon.com for more information.

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