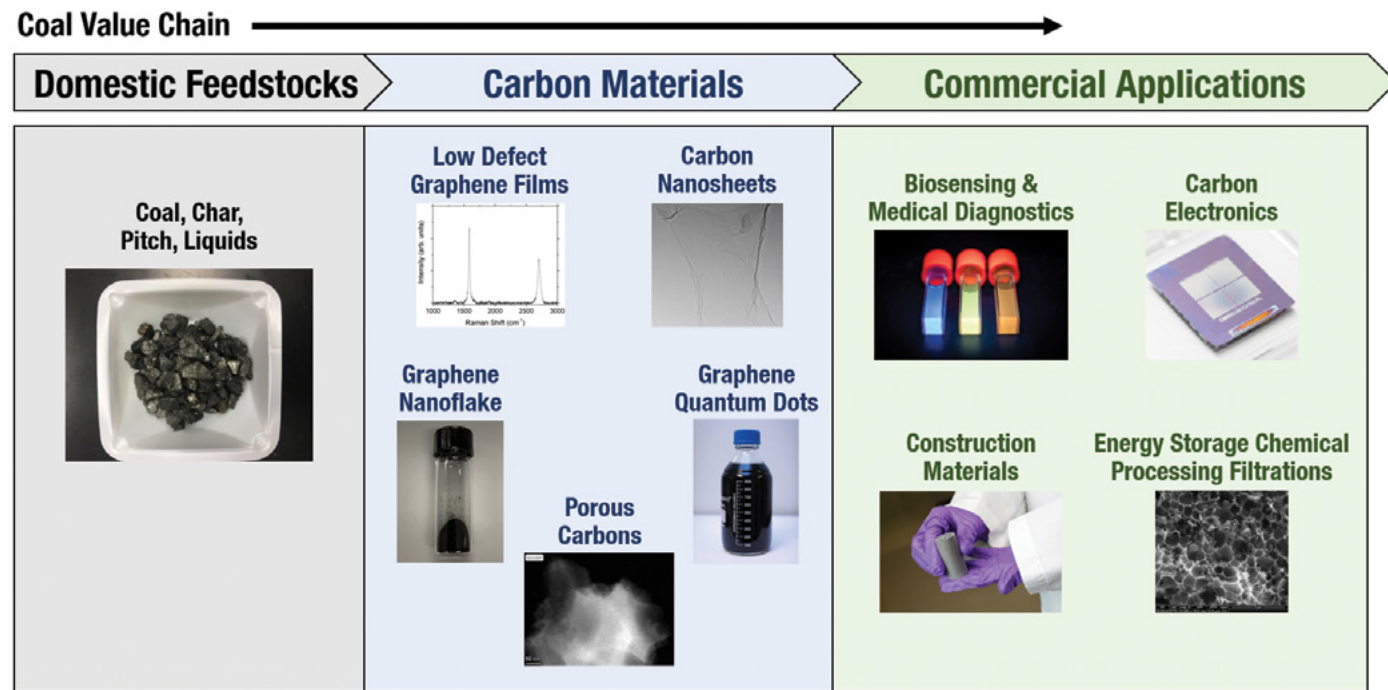


MANUFACTURING CARBON MATERIALS AND CONSUMER PRODUCTS FROM COAL

Cost-competitive, high-value products from coal create new jobs, products, and markets for domestic coal.

COAL-BASED MANUFACTURING CREATES NEW BUSINESS OPPORTUNITIES

NETL's Advanced Coal Processing Program develops technologies that convert coal into salable carbon materials and consumer products instead of burning it to produce electricity and greenhouse gas emissions. Products manufactured from coal range from high-volume construction materials, such as concrete additives, to high-value dielectric materials used in miniaturized computer electronics.



Coal is not traditionally used to manufacture high tech materials. As such, coal-based manufacturing creates new business opportunities for the coal industry at a time when demand for coal-based electricity is rapidly declining. Coal's use as a manufacturing feedstock also creates opportunities to reduce manufacturing costs and improve the performance of carbon materials and products over what can be achieved with conventional feedstocks.

NETL MANUFACTURES ADVANCED CARBON MATERIALS DIRECTLY FROM DOMESTIC COAL

NETL researchers develop physical and chemical processing methods to make high-performance carbons from coal. Current materials manufactured by NETL include: atomically-thin dielectric materials for memristor computer memory devices, low-defect graphene films for sensor and medical diagnostic applications, engineered graphene flake to improve the strength and durability of concrete construction materials, and porous sorbents for hydrogen energy storage and water remediation applications.



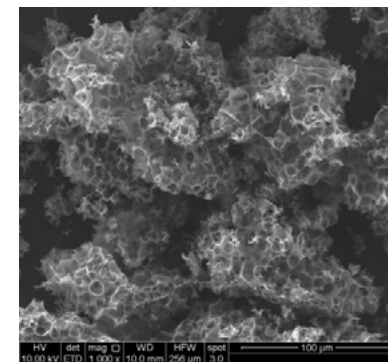
NETL'S COAL TO GRAPHENE (C2G) PROCESS WINS AN R&D 100 AWARD



NETL's low-cost Coal to Graphene (C2G) technology was recognized with a prestigious R&D 100 Award. The technology produces bulk quantities of nanostructured, graphene-like, carbon from anthracite, bituminous, and sub-bituminous ranks of coal. NETL is partnering with Ramaco Carbon through a Cooperative Research and Development Agreement to further develop this technology for commercial applications.

COAL-BASED POROUS CARBONS SHOW POTENTIAL FOR ENERGY STORAGE AND WATER PURIFICATION APPLICATIONS

Using Powder River Basin Coal as a feedstock, NETL researchers synthesized a series of porous carbons with narrow and tunable pore size distributions ranging from 1 to 50 nanometers. This allows researchers to design sorbent materials with pore sizes that are matched to small gas molecules (e.g., hydrogen), atomic ions (e.g., S²⁻), and larger organic molecules (e.g., polycyclic aromatic hydrocarbons). This tunability opens opportunities to use these materials for increasing the amount of hydrogen gas that can be safely stored inside vehicular fuel tanks, enhance the efficiency and durability of LiS batteries, and to remove salts and organic waste from industrial waste water streams. NETL is currently collaborating with industrial partners to evaluate the commercialization potential of this technology.



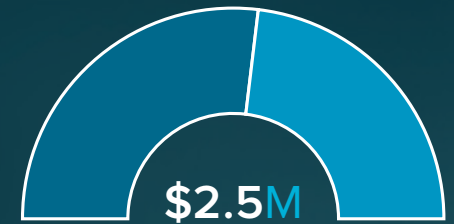
Electron Microscopy Image of Coal-derived Porous Carbons:

These carbon materials have high surface areas (1500-3500 m²/g) and can be utilized in energy storage applications for batteries and supercapacitors.

AWARD NUMBER
FWP-1022432

PROJECT BUDGET

FY20 FUNDING



● MDD* \$1,145,000

* Materials Discovery and Design

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