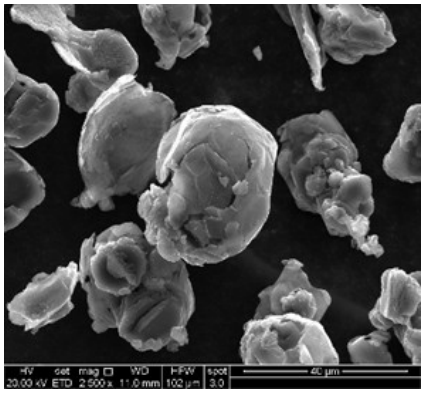
TECHBRIEF

NETL Ref. No: 25N-11

Low-Temperature Catalytic Method for Synthesizing Highly Crystalline Graphite from Coal, Biomass & PET Coke



Highly crystalline graphite made with NETL process.

Opportunity

The U.S. Department of Energy's National Energy Technology Laboratory (NETL) has developed a method to efficiently convert coal, biomass, petroleum coke (PET coke), and other forms of carbon into a highly crystalline, low-ash-content graphite using a low-temperature catalytic process. The technology significantly reduces energy consumption and processing time compared to traditional methods, offering a cost-effective method for using domestically sourced feedstocks for making graphite for lithium-ion batteries, electric arc furnace electrodes, nuclear reactors and advanced carbon composites. Specifically, graphite is synthesized from coal, biomass, PET coke or other carbon feedstocks using a low-temperature (1,200-1,500 °C) process with a Fe_2O_3- based catalyst. The process separates the catalyst and graphite product and regenerates the catalyst for reuse. This technology has several novel facets: 1) the processing temperature and time are reduced in comparison to traditional graphite manufacturing, 2) a powder graphite product is produced versus a graphite rod or formed structure, and 3) the method can be practiced as a continuous process versus a batch process. This invention is available for nonexclusive licensing and/or further collaborative research from NETL.

Problems Addressed

- Domestic production of high-quality graphite, particularly for lithium-ion battery anodes and electric arc furnace electrodes, is critically needed to address significant supply chain vulnerabilities.
- Conventional methods for synthetic graphite manufacturing are notoriously energy intensive.
- Global demand for graphite is projected to increase 25-fold over the next 15 years.

Potential Commercial Application

- Lithium-ion battery anode production
- Electric arc furnace electrode production
- Graphite for composites
- Specialty graphite manufacturing: Ideal for demanding high-performance applications such as rocket nozzles, nuclear reactor components and advanced composites.

Competitive Advantages

- Reduced energy consumption: Approximately 50-70% less energy is used.
- Lower production costs: Less energy and less time decreases overall production costs.
- Enhanced supply chain security: Entirely domestic feedstocks can be used in the process.

Intellectual Property Status

A provisional patent application has been filed.

Licensing

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