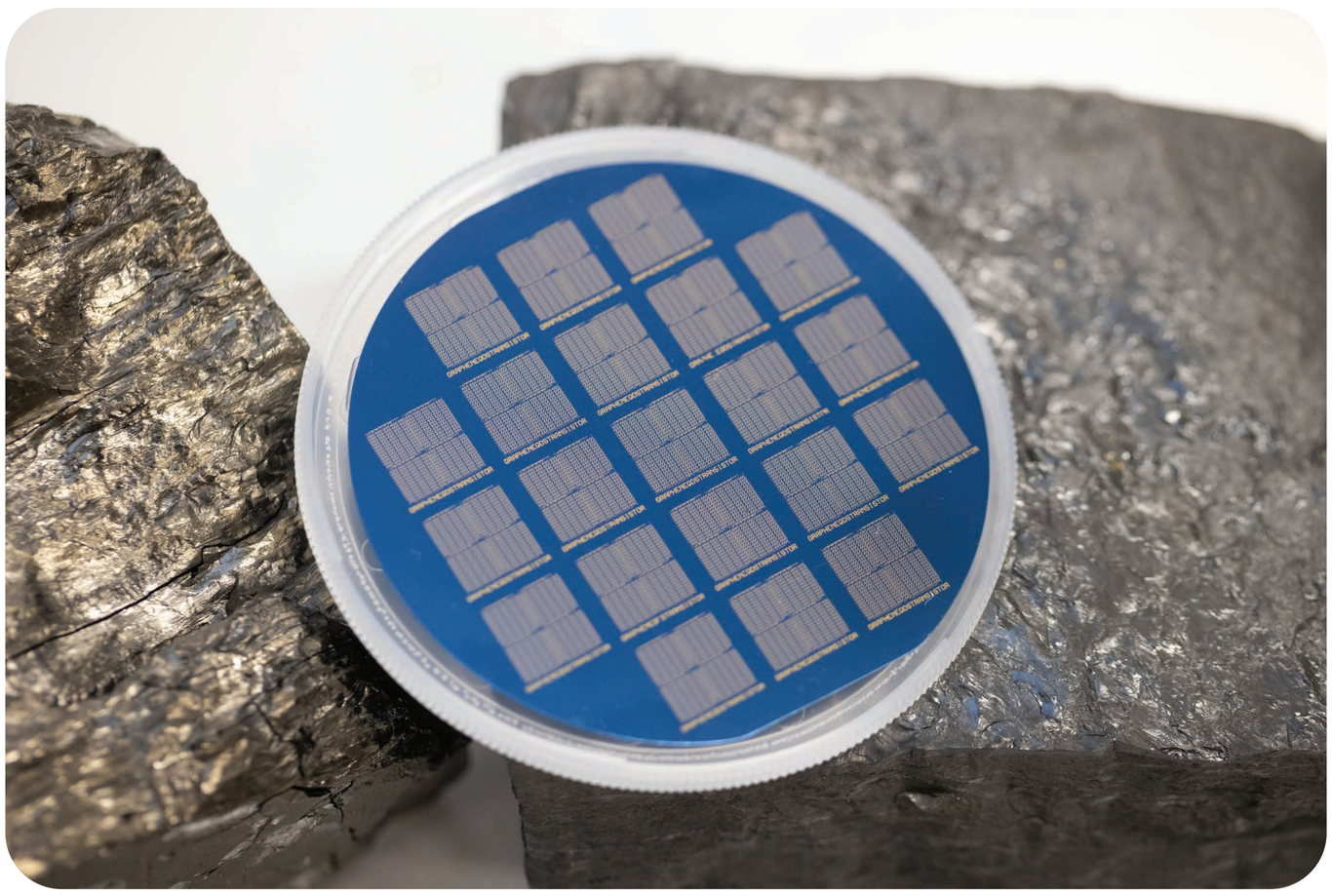
Groundbreaking Technologies Used To Create High-Tech Products From Coal Waste

NETL, University of Illinois at Urbana-Champaign, Oak Ridge National Laboratory, and TSMC create methods to use coal as a manufacturing feedstock for high-value microelectronics.



A 3-inch wafer with over 15,000 field effect transistors fabricated with carbon material derived from coal.

Researchers created technologies including a thin carbon material used to reduce the size of computer devices, improve their performance, and enhance their energy efficiency.

- The team used this carbon material to fabricate a memory device called a “memristor,” which stores data, as well as a field effect transistor that processes data in computers.
- These memristors reduce energy consumption five- to twentyfold over commercial technology and overcome device variability issues that have plagued the field.
- These transistors run faster and at lower power than conventional silicon technology.
- Both types of devices are made with domestic coal and simple processing technologies, lowering the barrier for U.S. firms to enter this market and innovate in a way that cannot be achieved with conventional materials and manufacturing methods.

DOE PROGRAM

Minerals Sustainability

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OAK RIDGE National Laboratory

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