Better Microelectronics from Coal

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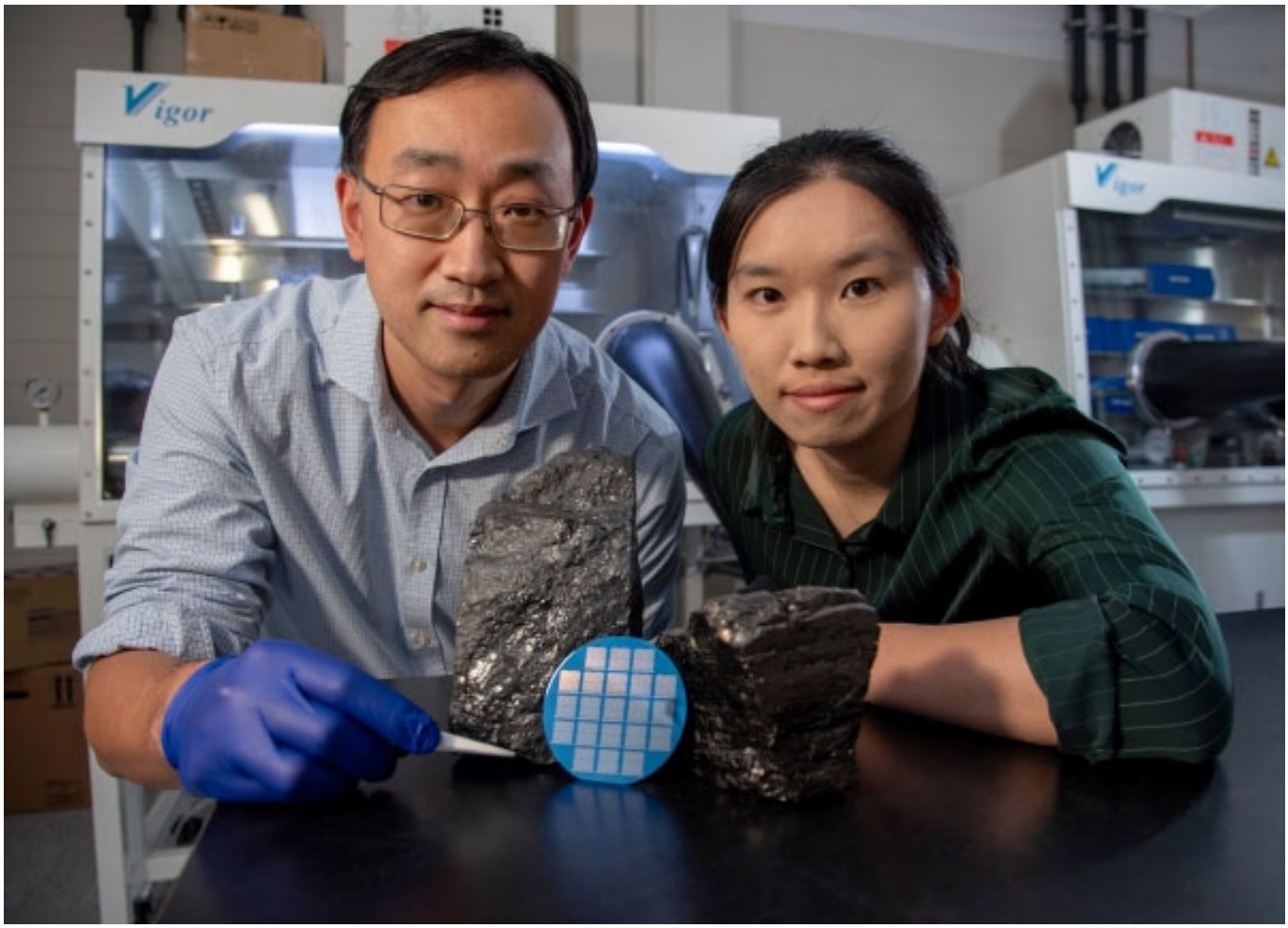

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Coal is an abundant resource in the United States that has, unfortunately, contributed to climate change through its use as a fossil fuel. As the country transitions to other means of energy production, it will be important to consider and reevaluate coal's economic role. A joint research effort from the University of Illinois Urbana-Champaign, the National Energy Technology Laboratory, Oak Ridge National Laboratory and the Taiwan Semiconductor Manufacturing Company has shown how coal can play a vital role in next-generation electronic devices.

"Coal is usually thought of as something bulky and dirty, but the processing techniques we've developed can transform it into high-purity materials just a couple of atoms thick," said Qing Cao, a U. of I. materials science & engineering professor and a co-lead of the collaboration. "Their unique atomic structures and properties are ideal for making some of the smallest possible electronics with performance superior to the state of the art."

A process developed by the NETL first converts coal char into nanoscale carbon disks called "carbon dots" that the U. of I. research group demonstrated can be connected to form atomically thin membranes for applications in both two-dimensional transistors and memristors, technologies that will be critical to constructing more advanced electronics. These results are reported in the journal Communications Engineering.

Read more at: University of Illinois Urbana-Champaign

MatSE professor Qing Cao with graduate student and lead author Fufei An. (Photo Credit: Heather Coit/Grainger Engineering)