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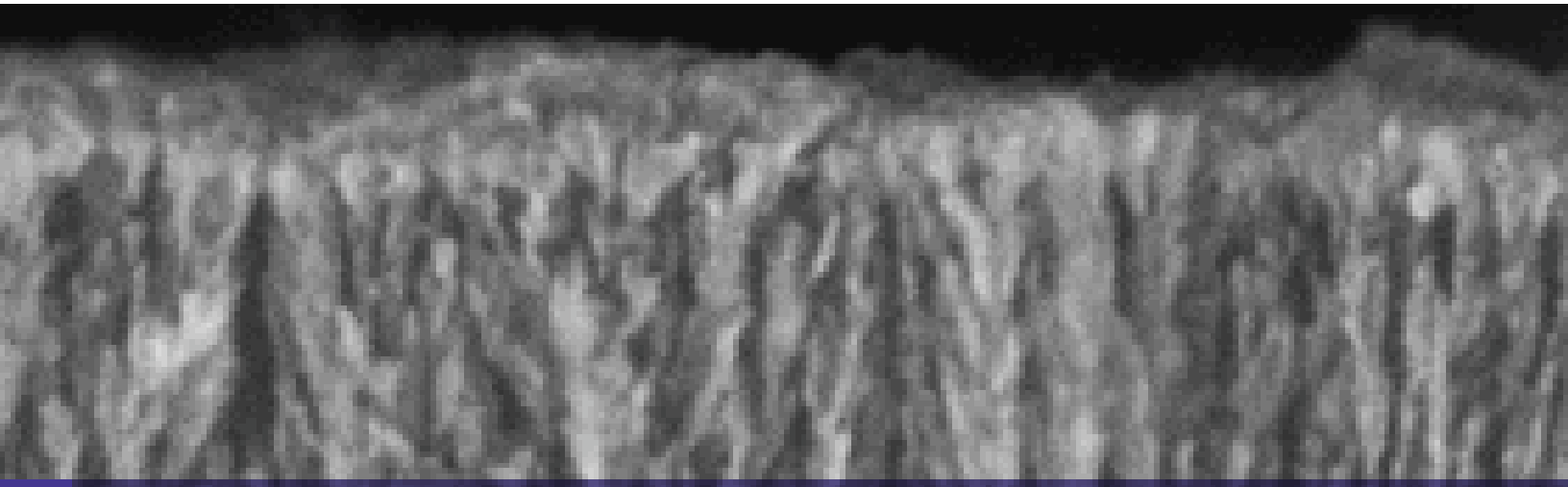

DIAMOND NANOFEATHER STRUCTURE LAYS GROUND FOR **LOW-COST FABRICATION OF ENERGY STORAGE DEVICES**

THE IMPETUS

Porous diamond is an ideal material for electrical and electronic devices, such as sensors, supercapacitors, catalysts and solar energy conversion devices. However, manufacturing porous diamond is expensive. The cost of the two methods typically used, mask and etch or template and coat, vary, depending on characteristics of the material being processed. Certain properties of diamond boost the manufacturing costs: etch and growth rates of diamond are low; diamond deposition temperature is high; and diamond adhesion can be poor.

Users of the Center for Nanoscale Materials (CNM), a U.S. Department of Energy Office of Science user facility located at Argonne National Laboratory, from Advanced Diamond Technologies, Inc., demonstrated a new diamond nanostructure fabricated by a straightforward electrochemical etching method without masks or templates.

THE WORK

The nanostructure is made from boron-doped nanocrystalline diamond (NCD) with a high density of grain boundaries, and it is distinct from the conventionally defined NCD or ultrananocrystalline diamond. The porous nanofeather structure has a very high aspect ratio. Preliminary characterization with Raman spectroscopy and scanning electron microscopy (SEM) indicates the fabricated diamond nanofeathers (DNFs) have a capacitance 300 times greater than the source NCD film. DNFs may well offer a third — and affordable — option for fabricating diamond nanostructures for electrical and electronic applications.

The users from Advanced Diamond Technologies, Inc., used Raman spectroscopy and high-resolution SEM resources at the CNM.

THE IMPACT

The electrochemical etching method employed may offer a low-cost alternative to traditional diamond nano-structure fabrication techniques, eliminating masks and templates and resulting in high performance materials.

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