Nanocrystalline diamond probes overcome wear

Researchers at the McCormick School of Engineering and Applied Science at Northwestern Univ. have developed, characterized, and modeled a new kind of probe used in atomic force microscopy (AFM), which images, measures, and manipulates matter at the nanoscale.

Using diamond, researchers made a much more durable probe than the commercially available silicon nitride probes, which are typically used in AFM to gather information from a material, but can wear down after several uses.

Horacio Espinosa, James and Nancy Farley Professor of Manufacturing and Entrepreneurship, and his graduate student Ravi Agrawal have shown that diamond atomic force microscopy probes are 10 times more durable than silicon nitride probes.

Their results were recently published in the *Journal of Applied Physics*.

“It is well-known that diamond should perform much better than other probe materials,” says Espinosa. “However, rigorous quantification of wear and the development of models with predictive capabilities have remained elusive. It was exciting to discover that diamond probes are an order of magnitude more wear resistant than silicon nitride probes and that a single model can predict wear for both materials.”

In the study, wear tests were performed using AFM probes made from different materials—silicon nitride, ultrananocrystalline diamond (UNCD) and nitrogen-doped UNCD—by scanning them across a hard UNCD substrate. Argonne National Laboratory, where UNCD was originally invented, also supported this work by providing nitrogen-doped UNCD. Probes were made in house and also provided by Advanced Diamond Technologies, Inc. (ADT).

“It took quite an effort to develop UNCD into a sharp tip. We needed to optimize the initial stages of diamond growth to form nanometer structures with consistent results. It is really nice to find that this work paid off to demonstrate that UNCD probes are quite wear resistant, which we predicted,” said Nicolaie Moldovan, a former commercial availability NaDiaProbes.

Neil Kane, president of ADT, said, “The results reported in this investigation are impressive in showing the improvement in wear resistance of diamond probes. This work in part inspired the development of our commercially available NaDiaProbes.”

**SOURCE**

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Advanced Diamond Technologies, Inc. has announced the introduction of UNCD Horizon, the world's smoothest vapor-deposited diamond, to its family of award-winning diamond products. UNCD Horizon represents a generational leap in diamond wafer technology that brings the surface roughness of diamond films to levels comparable to electronic grade silicon wafers; opening up new vistas for the application of diamond into a wide variety of electronic and biomedical devices.

ASafeDrive, LLC released a highly-innovative mobile platform device—ASafeDrive. The new technology, now available for $0.99 at the Apple App Store or at www.asafedrive.com, specifically aims to help commuters maintain vehicle speeds within legal limits throughout the Los Angeles area and across the United States.

Beckman Coulter Inc. introduced its Kaluza Flow Cytometry Analysis Software, a package that reduces processing and analysis times, allowing researchers more time to explore their data. Kaluza Software features new tools that simplify the management of multiple complex data sets, allows visualization of high-content data in different spatial dimensions on a single plot, and provides real-time analysis of high-content flow cytometry files.

nmLaser Products, Inc. announced its new FlexSorb line of high performance laser shutters incorporating a non-contact electromagnetic design and thermal dissipation. The new FlexSorb family of shutters features a high damage threshold, quick switching speed, small size, and quiet operation.