ERC Pioneers Deep Wet Etching Process for Use in Semiconductor Production

Outcome/accomplishment: A research team at the Nanomanufacturing Systems for Mobile Computing and Mobile Energy Technologies (NASCENT) center, an NSF-funded Nanosystems Engineering Research Center (NERC) headquartered at The University of Texas at Austin, has developed a new deep wet etching process that could lead to higher quality semiconductor production at lower cost.

Impact/benefits: The process of metal-assisted chemical etching (MACE) shows promise for the semiconductor industry because it produces deep, high-quality grooves at relatively low cost. The process developed by the Center removed a significant barrier to the adoption of MACE for the fabrication of 3D semiconductor devices and biodevices.

Explanation/background: Wet chemical etching is considered a cost-effective method for producing semiconductors, but the current process reduces the resolution of the etched pattern. MACE is a relatively new wet etching technology, producing high-quality patterns using gold as a metal catalyst. However, gold is not compatible with the semiconductor technology that is used to construct integrated circuit chips, including microprocessors, memory chips, and other digital logic circuits.

The NSF-funded research team developed a MACE process using the metal ruthenium with results that are comparable in quality to gold. The team also made significant progress toward developing a MACE fabrication system that is compatible with current semiconductor production technology.

A depiction of the metal-assisted chemical etching fabrication system designed by NASCENT researchers to produce semiconductor devices. (Photo credit: The University of Texas at Austin)