

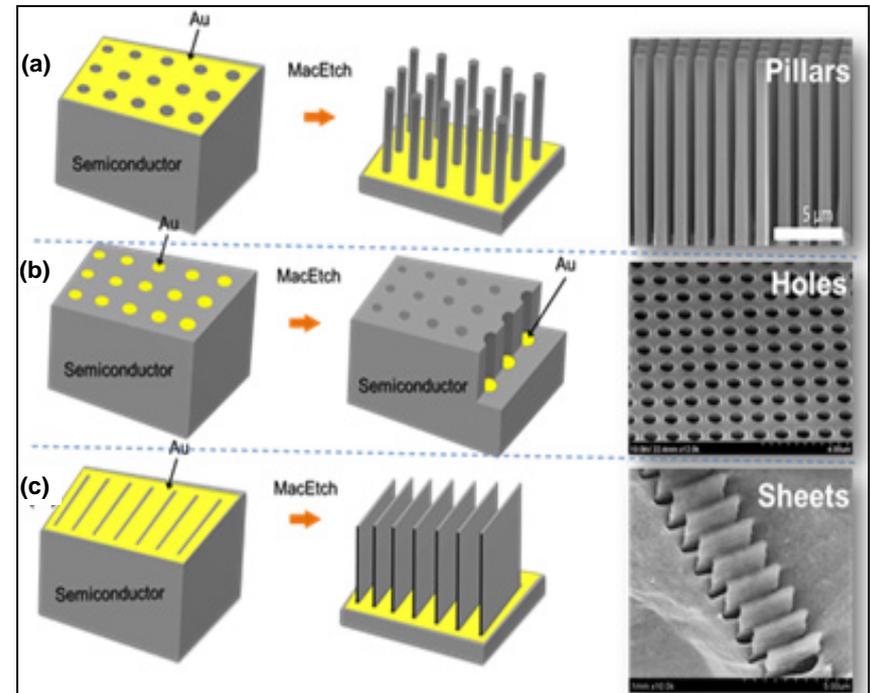


Defying Textbook Definition of Wet Etching



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Anisotropic Metal-Assisted-Chemical-Etching: Metal-assisted-chemical-etching (MacEtch) is a wet but anisotropic etching method for semiconductors. In this work, we demonstrate that MacEtch not only works for silicon, but is capable of producing high aspect ratio GaAs nanostructures. These high aspect ratio structures can potentially transform the fabrication of device structures that are currently fabricated by dry etch or bottom-up growth and assembly techniques. Examples include periodic nanostructures for photonic crystals, light trapping structures for LEDs and solar cells, 3D transistors, thermoelectric devices with roughened sidewalls, and nanowire batteries with greater energy density. MacEtch also brings affordability and possibly new device concepts for nanostructure based photonic and electronic devices. Linear and curvilinear Si and GaAs 3D nanostructure arrays, and high aspect ratio III-V homojunction and heterojunction LEDs fabricated by MacEtch have been demonstrated.



Schematic illustration of the MacEtch process to produce (a) pillars (from an Au mesh), (b) holes (from Au dots), and (c) vertical sheets (from Au film with slits), where the Au patterns descend into the semiconductor and the materials directly underneath the Au is removed. Au is used as an example; other types of metal can also be used.

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