



# Microscope Probe Having an Ultra-Tall Tip

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## Technology description

Atomically sharp micro-fabricated tips are used in atomic force microscopy (AFM) for scanning near-field microwave microscopy (SNMM) to create an image of the tiny topography on or under a surface. These tips can be created via semiconductor processing, attaching carbon nanotubes to AFM tips or focused ion beam milling.

However, these techniques are expensive, and can't be used to create tips with a height greater than 30 micrometers. With a short tip, capacitive coupling with the cantilever it is mounted on limits the ability to create an image. A taller tip would decrease parasitic capacitance and increase sensitivity. UW-Madison researchers have developed a method for fabricating a microscopic coaxial tip with a height greater than 30 micrometers. A coaxial tip and a coplanar waveguide are formed on a silicon substrate. The first layer of the tip shaft is made of a conductive material. Over the first layer, a layer of non-conducting material is deposited, followed by a layer of a different conducting material. An oxide etch exposes the first conductive layer at the tip.

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a method for fabricating a microscopic coaxial tip with a height greater than 30 micrometers for use in atomic force microscopy.

## Application area

Atomic force microscopy

Scanning near-field microwave microscopy

## Advantages

Decreases parasitic capacitance, increasing the sensitivity of SNMM

Provides AFM tips with a very high aspect ratio

Maintains the vertical sidewall necessary for AFM and SNMM profiling applications

Better suited to measuring topography and surface smoothness in high-resolution microelectromechanical systems metrology than conventional tips

Enables deep access to the sample

Cost is reduced because more than 400 probes can be fabricated in one batch on a four-inch silicon wafer

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