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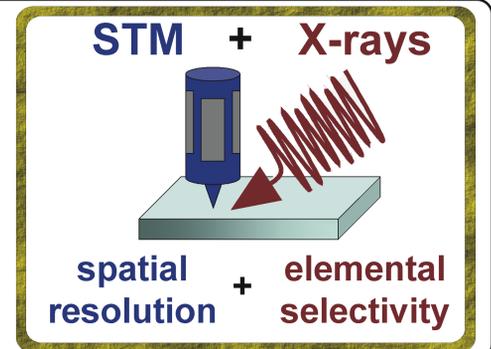
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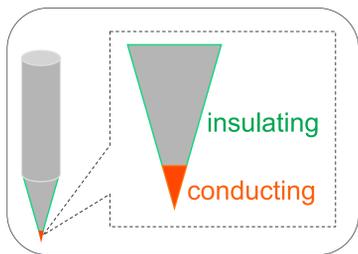
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## Motivation

- The combination of local x-ray interactions with a scanning probe tip provides the great potential of spatially resolved microscopy with chemical, electronic, and magnetic sensitivity.
- However, detection of photoejected electrons at the sidewall of the tip will limit the spatial resolution.



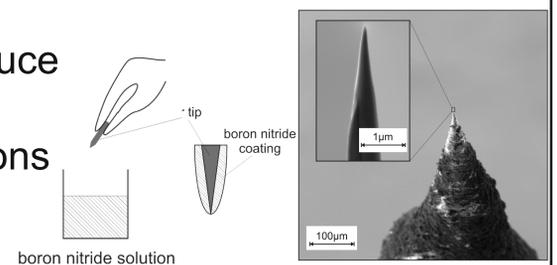
## Smart Tip Concept



- Tips have to be developed that are entirely coated by an insulating film except at the very apex.

## Legacy

- Dip-coating can produce BN films on PtIr tips.
- However, a few microns are always exposed.

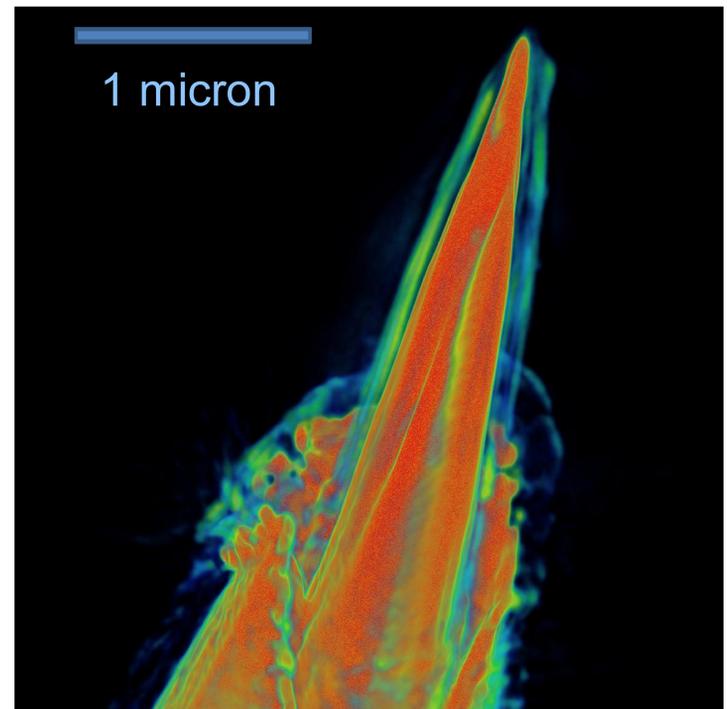


## Film growth at CNM



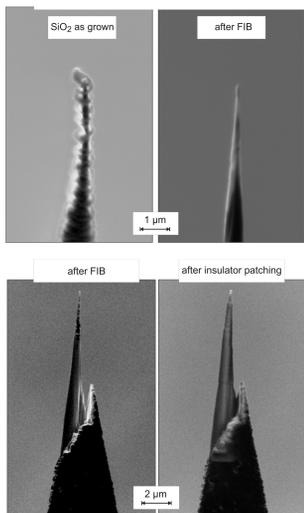
- Tips are electrochemically etched from Pt<sub>90</sub>Ir<sub>10</sub> wire.
- SiO<sub>2</sub> films are grown by electron beam physical vapor deposition.

## Characterization at APS



- X-ray nanotomography surface rendering of a smart scanning tunneling microscope tip. The platinum-iridium tip (red) has been coated with a SiO<sub>2</sub> insulating layer (green).

## NanoFab at EMC



- Tip apex is exposed by focused ion beam milling.
- Circular write pattern is used to "shave off" the oxide.
- Subsequently, an ethylsilicate precursor is applied in situ in order to repair coating and minimize the exposed tip area.

## Future Work

- Development of coaxial tips (metal/insulator/metal) in order to avoid charging effects.
- Use of different tip and coating materials.

