The University of North Dakota has developed an electron emitting branched nanoneedle that improves electron gun image clarity and resolution by increasing the signal to noise ratio. This is accomplished because the branched nanoneedle will emit electrons at a turn on field as low as 4.8 V/µm.

**Advantages**
- Low turn on field, resulting in significantly improved clarity and resolution of EM images
- Low cost of materials
- Simple synthesis - etching of silicon wafer to form silicon nanowire array, then grow branched nanoneedles on the residual silver particles that remain at the tips of the silicon nanowires

**Applications**
- Scanning and transmission electron microscope
- Field electron spectroscopy
- Any instrument requiring powerful electron gun

The method is able to produce a low turn on field because of the combination of silicon nanowire with multiple branched TCNQ needles attached from each. The combination of size, shape, and number of branched needles is thought to work together to produce the low turn on field.

**Contact**
Tara Kopplin  
(701) 777-3267  
tara.kopplin@research.und.edu

Reference UND #13-04 - Patent Pending