

Inductively-Coupled Plasma Reactive Ion Etching System (ICP-RIE) (Lu/Berger/Ringel, OSU)



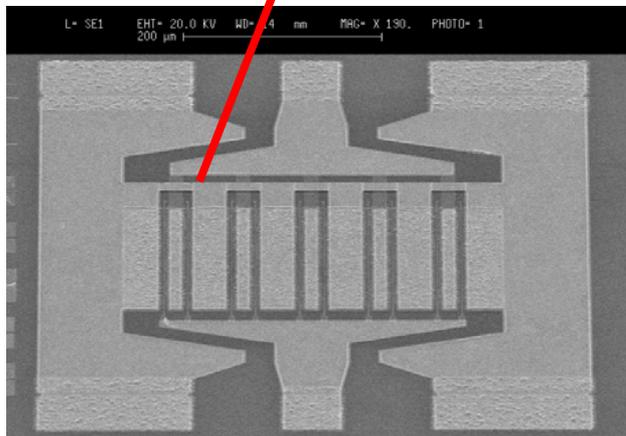
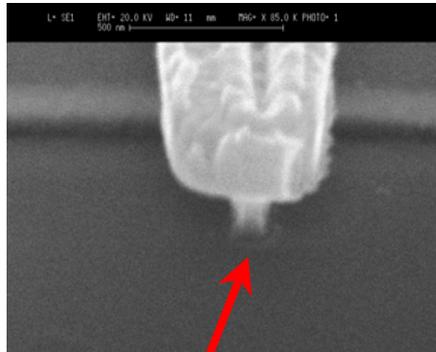
A new tool for etching of electronic materials at Ohio State. The acquisition of Oxford Instruments ICP180 system allows us to have the capability of etching the entire range of useful semiconductor materials, ranging from gallium nitride and silicon carbide, both of which are enjoying tremendous popularity due to their applications in blue light emitting devices and high power and high temperature electronics, to GaAs- and InP-based materials used in high speed electronic devices and optoelectronic devices and conventional Si-based materials for ULSI applications. This ICP etching system is especially ideal for III-nitride device fabrication because of its high plasma density and low etching-induced damages. This instrument is a cornerstone for the work on electronic materials and devices, nanoelectronics, and Bio-MEMS, etc. at Ohio State. The equipment is located EE cost-share Cleanroom, where over 40 graduate and undergraduate students and postdoc researchers are doing research in different areas.



Typical Associated Applications:

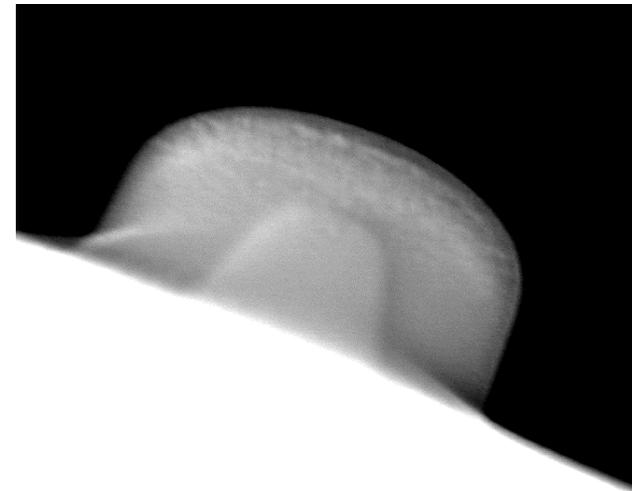
- Cryo deep silicon etching
- Bosch deep trench silicon etching
- Si lens etch
- Deep III-V materials etching
- Wide bandgap materials (GaN and SiC) etching
- Backside via etching by ICP
- Low damage gate recess ICP etching
- GaAs/AlGaAs DBR ICP etching using laser interferometer
- Surface roughening/modification
- SiN spacer etching over III-Vs or III-nitrides

High Speed, High Power Electronics



An AlGaIn/GaN heterojunction power transistor with 10 gate fingers and a gate-length of 70 nm. The mesa isolation and gate-recess is performed by ICP.

Quantum Dot Nanoelectronic Switches



TEM micrograph shows a semiconductor quantum dot encased in an insulating silicon dioxide dielectric. The quantum dot is patterned by electron beam lithography and etched by ICP. Electrons can quantum mechanically tunnel into and out of the central QD from electrodes (not shown).