Analysis of Semi-conductor devices by NanoSIMS and TOF-SIMS

TOF-SIMS with etching ion gun enables depth profiling at an area less than 5 μm. NanoSIMS can be utilized for imaging with high lateral resolution of 100nm with high sensitivity and high mass resolution. Both SIMSs have enough potential for dopant measurement at a small area.

Instrument type	Dynamic SIMS	TOF-SIMS with etching ion	"NanoSIMS 50L "
Lateral resolution	10 μm ~ 100 μm	200 nm ~ 5 μm	50 nm ~ 150 nm
Detection limit	ppb ~	ppm ~	ppm ~
Typical capable depth	5 nm ~ 50 μm	5 nm ~ 10 μm	5 nm~ 50nm
Mass resolution	depends on condition	depends on condition	High
#Elements analyzed	about 10 elements	All elements	7 elements

Depth profiling of B in Si sub. by TOF-SIMS with etching

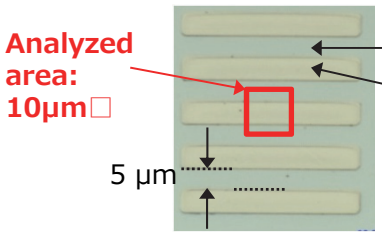


Photo. 1 Optical microscope image

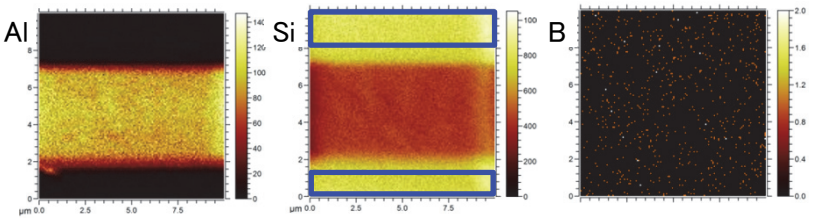


Image 1 Secondary ion images of Al, Si, B (10 μm x 10 μm)

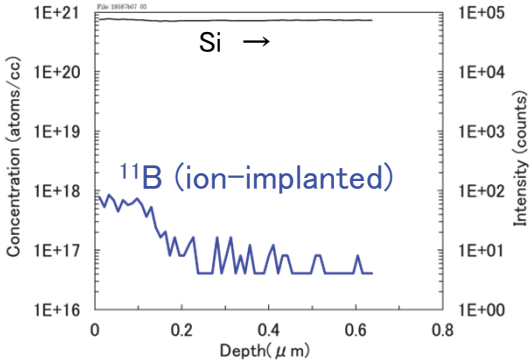


Fig.1 Depth profile of ^{11}B extracted from blue rectangles in Image 1

TOF-SIMS :
- **Depth profile at less than 5 μm area**
- **Qualitative analysis**

Analysis of SiC-MOSFET with TOF-SIMS and NanoSIMS50 L

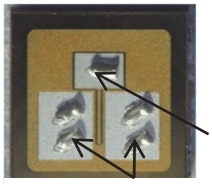
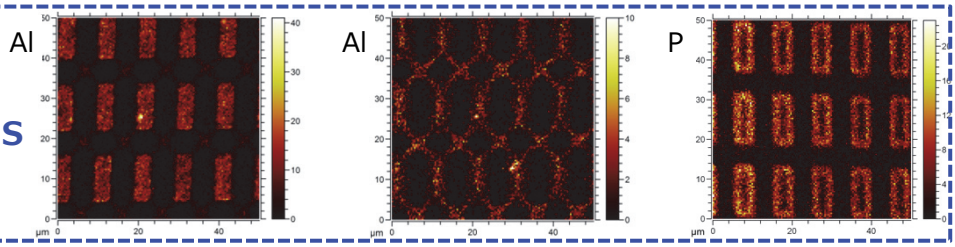


Photo. 2 SiC-MOSFET Chip

TOF-SIMS



Surface region | Al implanted region | P implanted region

NanoSIMS50 L

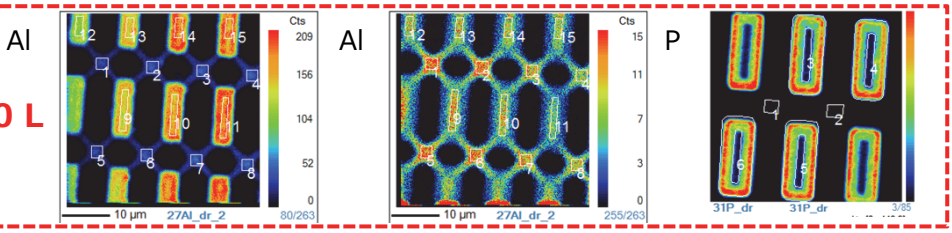


Image 2 Secondary ion images of Al and P in SiC layer

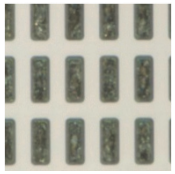


Photo. 3 Microscope image of SiC surface after passivation layer removal

NanoSIMS 50L :
- **High lateral resolution : 100 nm**
- **High sensitivity and high mass resolution**

NanoSIMS data were offered by AMETEK