Elemental and Crystal Orientation Analysis of SiC MOSFET
— High-sensitivity EDX, Transmission EBSD —

This slide introduces an example of using SEM-related equipments, EDX detectors and transmission EBSD to analyze the cross-section structure of SiC MOSFET (commercially available power devices). In these SEM-based analysis, the spatial resolution of high-precision EDX and Transmission EBSD can reach about 100nm and 20nm respectively.

High-sensitivity EDX analysis of the cross-section

After FIB treatment of the cross-section of the power device, elemental analysis can be performed using high-sensitivity EDX detector from tilting angle. Our high-sensitivity EDX detector can retain high count rate of characteristic X-ray even at low accelerating voltage and high spatial resolution
In this case, the detector can analyze structures at about 100nm through elemental mapping.

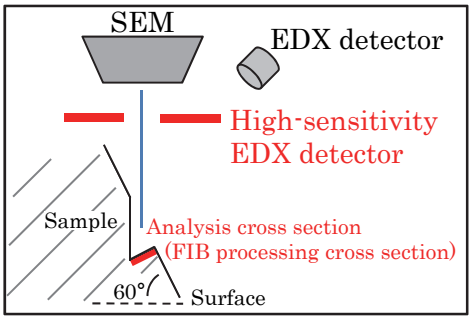

Fig.1 : Sample configuration in SEM-EDX measurements

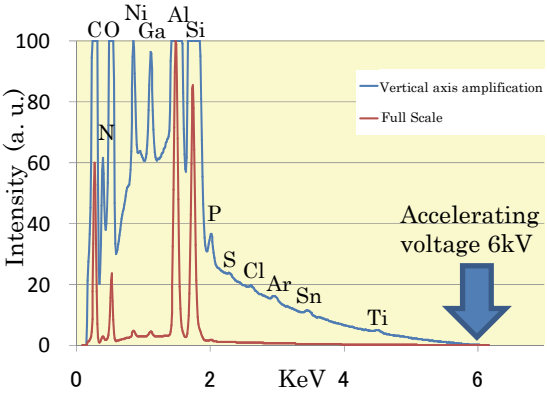

Fig.2 : EDX spectra in full view

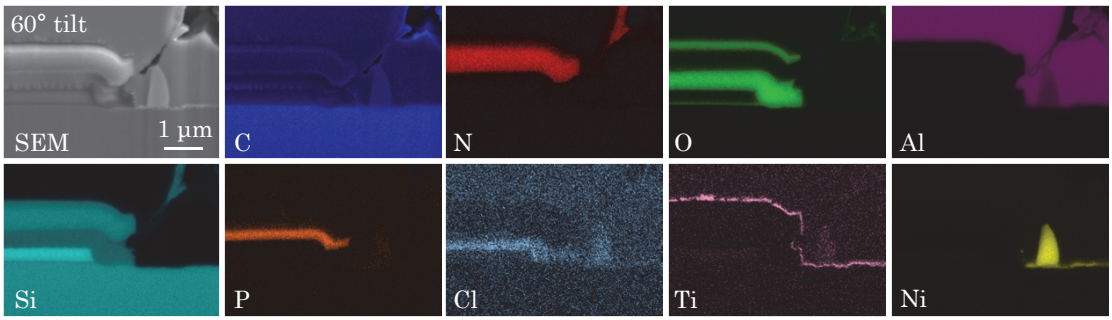

Fig. 3: SEM-EDX intensity mapping

Transmission EBSD analysis of the cross-section film

The thin-section is sliced by FIB and its crystal orientation is estimated by TEM and transmission EBSD. It is usually difficult to cover all crystal orientation using TEM- electron diffraction analysis. However by using transmission EBSD, we can even analyze refined crystal orientation of poly-Si through mapping.

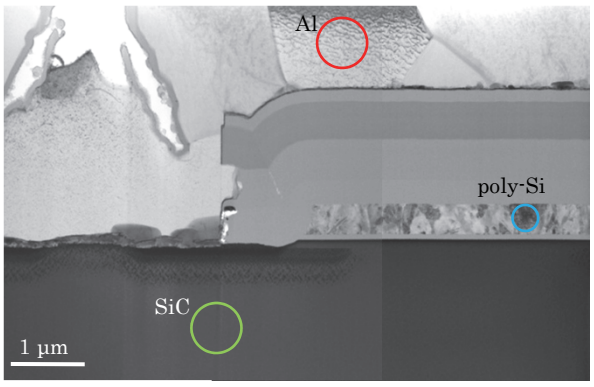

Fig.4 : BF-STEM image and position of electron diffraction pattern

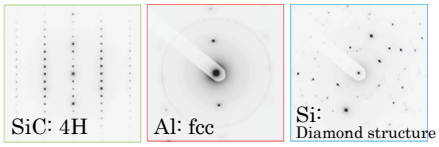

Fig.5 : Selected area electron diffraction patterns

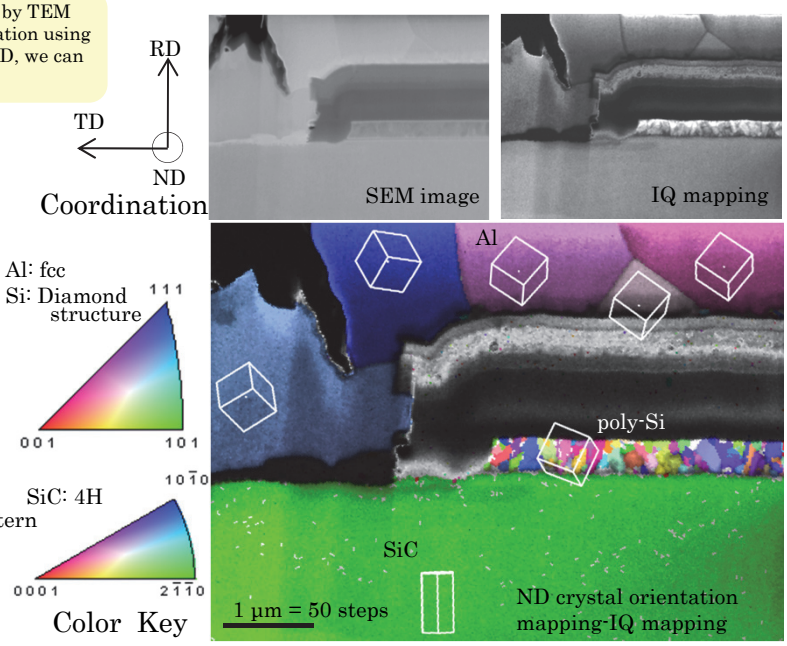

Fig.6 : SEM image, IQ (Image Quality) mapping and ND crystal mapping - overlay with IQ mapping