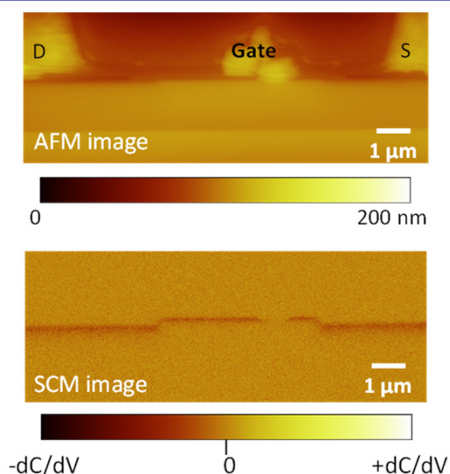
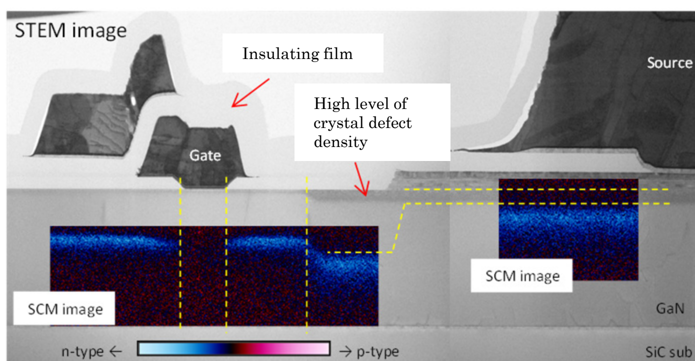
Interface Structure Analysis of High-frequency GaN-HEMT devices — SCM・EDX・EELS —

Analysis examples of AlGaN/GaN high electron mobility transistors (HEMTs) are shown.
By combining techniques of scanning transmission electron microscopy (STEM) and scanning capacitance microscopy (SCM), we have characterized the crystal structure and elemental composition/carrier distribution at the epilayers and chemical states at the SiN/AlGaN interface.

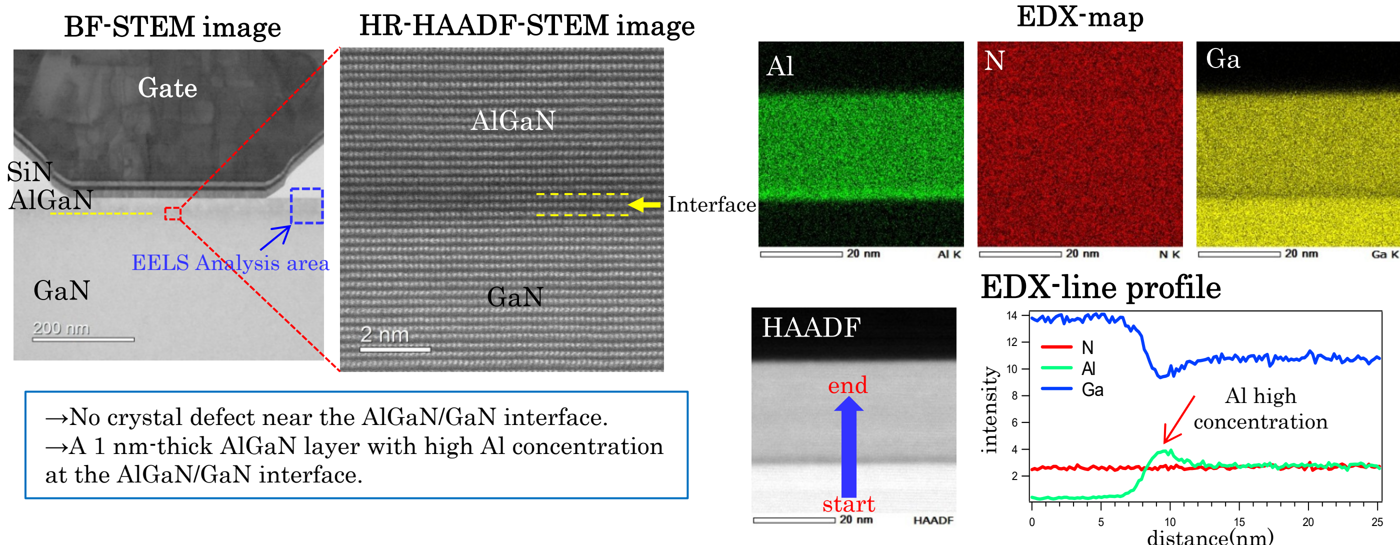
Carrier distribution evaluation using SCM and STEM





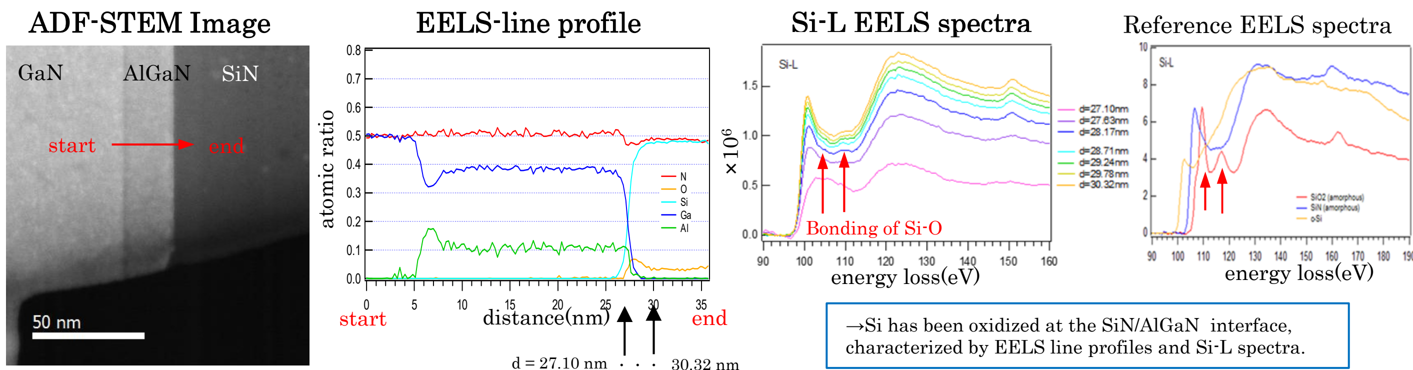
→ Lower carrier concentration under the gate electrode.

Evaluation of crystal structure and elemental composition distribution using aberration corrected STEM



→No crystal defect near the AlGaN/GaN interface.
→A 1 nm-thick AlGaN layer with high Al concentration at the AlGaN/GaN interface.

Evaluation of elemental composition and Si bonding states at the SiN/AlGaN interface using EELS



→Si has been oxidized at the SiN/AlGaN interface, characterized by EELS line profiles and Si-L spectra.

Toray Research Center, Inc.