NSYSU physics

學生研討會
Student Seminar

NATIONAL SUN YAT-SEN UNIVERSITY

Research on improving the performance and reliability of next-generation memory and analysis of the Performance and Reliability Mechanisms of GaN High Electron Mobility Transistors

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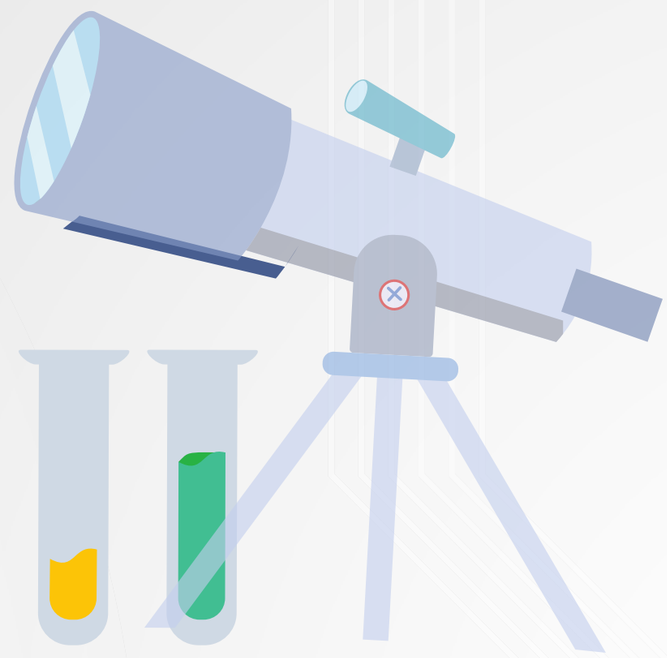
Abstract

Resistive random-access memory (RRAM) has attracted considerable attention as a promising non-volatile memory because of its simple structure, fast switching speed, and low power consumption. Meanwhile, GaN high-electron-mobility transistors (HEMTs) are suitable for high-frequency and high-power applications due to their wide bandgap and high electron mobility.
This dissertation investigates the performance and reliability of HfO_2-based RRAM and p-GaN HEMTs. For RRAM, Ag doping was introduced to reduce the forming voltage and suppress cell-size dependence by facilitating conductive-filament formation. For p-GaN HEMTs, off-state stress caused positive threshold-voltage shift and abnormal subthreshold-swing degradation, which were attributed to non-uniform electron trapping in the AlGaN region. In addition, low-frequency noise and random telegraph signal analyses were employed to characterize p-GaN/AlGaN interface defects, showing that stronger interface trapping is closely related to degraded channel conduction and device reliability.



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