Faculty Name:

Savannah Eisner

Faculty Email:

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Lab:

Eisner Group

Project Title:

Advanced Microscopy Techniques to Analyze Device Degradation in Gallium Nitride Transistors

Description:

Wide-bandgap gallium nitride (GaN) heterostructure devices that leverage the two-dimensional electron gas (2DEG) channel support the development of uncooled/unshielded microelectronic components and systems for robust operation in corrosive, radiation-rich, and ultra-hot/cold environments. The reliability of GaN 2DEG devices and circuits under hostile environmental conditions is rarely limited by the semiconductor material itself, and instead limited by the lack of suitable contact metallization and passivation schemes. Failure mechanisms associated with the contacts and passivation layers that cause premature device failure include gate sinking, voiding, electromigration, and passivation cracking. This project will involve the preparation and imaging of GaN high electron mobility transistor (HEMT) samples with novel metallization and passivation schemes that have undergone accelerated aging. Advanced microscopy techniques including high-angle annular darkfield scanning TEM (HAADF-STEM) and fast Fourier transform (FFT) TEM will be utilized to pinpoint device damage and investigate aging effects on the morphology of the alloyed contact stack, crystallinity of the heterostructure, and cracking in the passivation layers. The results will be correlated with findings from electrical measurements to determine the suitable of the device layers for extreme environment applications. This project will require working closely with other group members to perform experiments in the lab.

Location of Research:

On Site

# of hrs/week:

40

Department/Program:

Electrical Engineering

Eligibility:

MS

To apply, please contact:

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