

2026 HBCU CHIPS Network Conference

Contribution ID: 37

Type: ORAL

From GaN to Sapphire: How Substrate Influences MoSe₂/MoS₂ Heterostructure Properties

Thursday, April 2, 2026 12:45 PM (20 minutes)

2D transition metal dichalcogenides (TMDs) have attracted significant attention due to their unique properties, including layer-dependent band structures, valley-selective optical coupling, catalytic activity, large exciton binding energies, and strong nonlinear optical responses. These features make TMDs promising for next-generation optoelectronic and photonic devices. Stacking different monolayer TMDs to form van der Waals heterostructures enables precise tuning of band gaps from the visible to infrared range, enhancing optoelectronic performance. Integrating these 2D heterostructures with conventional three-dimensional semiconductors, such as GaN with a 3.4 eV band gap, further extends band gap tunability and device functionality. This study explores MoSe₂/MoS₂ heterostructures grown on GaN substrates using chemical vapor deposition (CVD), a scalable and reliable technique for large-area synthesis. We investigate how substrate and temperature influence the optoelectronic properties of the heterostructures, including the band gap and phonon modes. In addition, we examine optical properties, such as photoluminescence and absorption, as well as structural characteristics, including interlayer coupling, layer alignment, and crystal quality. By examining the differences between MoSe₂/MoS₂ grown on GaN and sapphire substrates, this study reveals the crucial role of substrate interactions in tuning TMD heterostructures for optoelectronic applications.

Academic or Professional Status

Faculty

Author: Dr SENEVIRATHNA, M. K. Indika (Clark Atlanta University)

Co-authors: MCELHANEY, Jamaris (Clark Atlanta University); BERRY, Trinity (Clark Atlanta University); RIVER-ANAPE, Yamil (Clark Atlanta University); JOHNSON, Kedar (Clark Atlanta University); WRIGHT, Elycia (Clark Atlanta University); GAYLE, Amari (Clark Atlanta University); PITIGALA, P. K. D. P. (Clark Atlanta University.)

Presenter: Dr SENEVIRATHNA, M. K. Indika (Clark Atlanta University)

Session Classification: Technical Session 3

Track Classification: Advanced Packaging