Workshop on Epitaxial Growth of Infrared Materials
Room Cummings Ballroom - Session WEG-SuM2

Workshop on Epitaxial Growth of Infrared Materials: IR Superlattices II

Moderator: Philip Klipstein, Semiconductor Devices

10:30am **WEG-SuM2-8 Antimonide Superlattices and Avalanche Photodiodes: Paving the Way for the 4th Gen of Infrared Detectors?**, ***Sanjay Krishna,*** Ohio State University **INVITED**

Photonic infrared detectors have witnessed three generations of development since their first reports in the 1950s-60s. The detectors have evolved from single element to linear to large format 2D arrays. In this talk we will discuss a vision for the fourth generation of infrared detectors that incorporate on demand functionality like gain, color, polarization at the pixel level. A low noise linear mode avalanche photodiodes (LmAPDs) is a critically enabling component for eye-safe long range LiDAR and remote sensing applications. Unlike PIN diodes, APDs provide internal gain that can lead to increased signal to noise ratio and suppress downstream circuit noise. the highest performing infrared APDs are based on interband transitions in mercury cadmium telluride (MCT, HgCdTe). Commercial ADPs use an InGaAs absorber with an InAlAs or lnP multipliers. We are investigating two antimonide based multipliers, AlGaAsSb and AlinAsSb, on inP substrates. We have recently demonstrated separate absorber charge and multiplier (SACM) ADPs using an InGaAs/GaAsSb Type-ll superlattice absorber and an AlGaAsSb multiplier[1]. We will discuss the technical challenges associated with the design, growth, fabrication and test of these LmAPDs and the potential for the development of these critical APD arrays for longer wavelengths.

Jung et al 'Low Excess Noise, High Quantum Efficiency Avalanche Photodiodes for Beyond 2 μm Wavelength Detection' (Nature Photonics in review, 2024).

11:00am **WEG-SuM2-10 Molecular Beam Epitaxy of Antimonides for Mid-to-Long Wavelength Infrared Sensing**, ***Stephanie Tomasulo***, *M. Twigg, A. Grede, W. Bewley, J. Massengale, I. Vurgatman,* U.S. Naval Research Laboratory*; J. Nolde,* U.S. Naval Research Lab **INVITED**

This presentation will cover the growth of antimonides for mid-to-long wavelength infrared sensing applications. High quality III-V materials in this wavelength range are difficult to access due to the prevalence of Auger recombination at these low bandgap energies. Furthermore, the materials with the lowest bandgap energies (and thus longest wavelength response) are lattice-mismatched to the nearest conventional binary substrates GaSb, InAs, and InSb. Techniques such as strain-balanced superlattices and compositionally graded buffers have been used to overcome these challenges. We will go over the basics of these techniques as well as our recent results employing them.

11:30am **WEG-SuM2-12 Panel Discussion**,

12:15pm **WEG-SuM2-15 Closing Remarks & Sponsor Thank Yous**,

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