Research Opportunity: Synthesis of Epitaxial Cubic Boron Arsenide Films for Wafer-Scale Thermal Management.

Inadequate thermal management presents a serious roadblock to accessing the full capabilities of high power devices and hinders advances in next generation electronics. To address this, ultra-high thermal conductivity materials are needed. In the last several years, cubic boron arsenide has emerged as an extremely promising material for thermal management, with demonstrated thermal conductivity greater than 1000 W/m-K in small synthesized crystallites. However, these bulk crystallites are incompatible with device integration.

The objective of this program is to synthesize high-quality cubic boron arsenide thin films by molecular beam epitaxy. Of particular interest is the synthesis of cubic boron arsenide on bulk substrates of InSb, CdTe and GaN, which are relevant for mid-wavelength infrared and high power electronic device applications. In thin film format, cubic boron arsenide has the potential to outperform the current state of the art, diamond, with regard to thermal management.

The fellow will have access to extensive facilities for epitaxial growth, thermal transport measurements, structural and defect characterization, and a class 100 cleanroom for nanofabrication.

Keywords: molecular beam epitaxy, thermal conductivity, cubic boron arsenide

Lab Location:

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