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High quantum efficiency medium wavelength infrared InAs/GaSb/AlSb focal plane arrays with bulk-limited dark current

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Abstract

We demonstrate the performance of Medium Wavelength InfraRed (MWIR) InAs/GaSb/AlSb superlattice epitaxial structures. The dark current is bulk-limited to a pixel size smaller than 30 x 30 μm^2, indicating high performance dielectric passivation which is crucial for low noise performance in small pitch FPA applications. The device structure is an absorber-over-junction type which combines the benefits of a high-minority-carrier-mobility absorber and a p-on-n design.

Figures of merit include a low bias dark current density of 10^{-6} A/cm^2 at 120K, for devices with a cut-off wavelength of 5 µm, and an external quantum efficiency of 60% without anti-reflection (AR) coating. The efficiency is measured with illumination from the backside of the wafer with the substrate fully removed. The interference pattern of the signal indicates that reflection against the top contact improves the quantum efficiency. The dark current shows a strong bias dependence, indicating the presence of tunneling current.

A focal plane array with 640 by 512 pixels and 15 µm pitch hybridized to ISC0403 readout circuit was processed based on this barrier structure.

Biography

H. Malm has been project managing the type-II-superlattice related research and development at IRnova since the company was founded in 2007 and before that at Acreo where she has worked as a project manager and development engineer since year 2000. She holds an MSc in Engineering Physics from Lund Technical University, Sweden.