MCT by MBE on GaAs at AIM: State of the Art and Roadmap

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For many IR companies, the development of molecular beam epitaxy (MBE) technology as a fabrication process for HgCdTe (MCT) material has been a prime focus to benefit from its considerable cost reduction potential and the capability to produce 3rd generation IR devices. At AIM, the MBE process on the alternative substrate GaAs is making rapid progress since 2009.

In multiple publications over the last years, MCT MBE on GaAs has been shown to be a very versatile and promising material system and indeed may be the prime candidate among the alternative substrates for the fabrication of high-performance detectors across the whole IR composition range. High quality growth will be demonstrated in the Cadmium fraction range $0.2 < x(Cd) < 0.8$. The main focus of development at AIM has been the MWIR segment with detector formats of 640 x 512 and 1280 x 1024 pixel with 15 µm pitch. For the former, a pixel operability of 99.5% at an operating temperature of 120 K with low dark current has been reported. In addition to the MWIR band, the performance of MBE grown MCT on GaAs is being evaluated for the LWIR and SWIR regions, both of which are key elements of advanced 3rd generation IR multi-spectral detectors.

This contribution will provide an up to date overview as well as selected highlights of AIM´s MBE technology development across the whole MCT composition range.

Keywords: Infrared Detectors, HgCdTe, SWIR, MWIR, LWIR, MBE, GaAs substrate

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Short version (ca. 100 words):

MBE growth of MCT on alternative substrates is a key technology to achieve both fabrication cost reduction as well as the capability to produce 3rd generation multi-spectral IR detectors. Multiple publications in recent years have established GaAs as maybe the most promising alternative substrate candidate. The capability of this material system to produce high-quality MCT across the composition range $0.2 < x(Cd) < 0.8$ will be demonstrated. This is the foundation for an up to date overview as well as selected highlights of AIM´s MBE technology development across the whole MCT composition range.