

Recent Results of 2-dimensional LW- and VLW- HgCdTe IR FPAs at AIM

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Due to upcoming demands and applications for IR detectors, AIM has expanded its portfolio of standard IR focal plane arrays (FPA) in the 3-5 μm (MWIR) and 8-10 μm (LWIR) spectral range by 2-dimensional IR detectors, sensitive in the 0,9-2,5 μm (SWIR), 8-10 μm (LWIR) and especially in the 8-15 μm (VLWIR).

The operational need for light-weight, compact low cost IR-modules with minimum power consumption has continuously been growing. To match such requirement, AIM started 2007 the development of a MCT 640x512 IR-detector with 15 μm x 15 μm pitch. The detector array is of nearly the same size as the 288x384 detector array with a pitch of 24 μm x 24 μm . This allows the integration of such a full TV resolution detector in qualified and fielded compact dewar/cooler assemblies for 2x resolution in a given space. While 3-5 μm detectors cover many standard requirements, the gold standard for critical military missions is still the 8-10 μm window. For this spectral range, however, the material growth of the epitaxial MCT layer and the subsequent array processing is much more critical with respect to homogeneity, post correction uniformity, number of defective pixels and linearity under high illumination conditions. AIM rapidly demonstrated prototypes of MCT 640x512 detectors with 15 μm pitch and cut-off wavelength of 10 μm by end of 2008 and is now in process of serialization. The relevant material and array processes, the progress in development, as well as results from CMT 640x512, 15 μm pitch IR-modules, sensitive in the LWIR will be presented.

For spaceborne commercial satellite systems such as the Meteosat Third Generation (MTG) program, AIM develops MCT based 2D very long wavelength (VLWIR) detector arrays with a cut-off wavelength > 14 μm . In order to achieve both high radiometric as well as high imaging performance in the infrared, cryogenically cooled photovoltaic MCT quantum detectors are preferential candidates for 2-dim. arrays and best suited for the application in mind. They offer highest quantum efficiency and a significantly lower power dissipation as compared to photoconductive devices. However, since the dark current of photodiodes increases exponentially with increasing cut-off wavelength, the operating temperatures of MCT PV detectors with cut-off wavelength above 12 μm are typically 50 – 60 K. Therefore until recently, VLWIR MCT detectors have been built with photoconductive (PC) linear arrays or small pixel 2D arrays facilitating higher operating temperatures between 80 K and 120 K. One requirement for feasible 2D PV arrays is a significant reduction of the dark current. For the AIM standard n-on-p technology on LPE-grown MCT, the low dark current for PV-detector arrays could not be achieved using standard Hg-vacancy p-doping due to Shockley-Read recombination processes. Extrinsic doping was applied instead, resulting in a significant decrease in dark current by more than an order of magnitude. This allows for excellent performance in the VLWIR at operating temperatures of 50 K – 60 K. AIM presents its latest results on extrinsically p-doped (256x256) VLWIR MCT-photodiode arrays with a cut-off wavelength > 14 μm .

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