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Crosstalk suppressing design of GaAs microlenses integrated on HgCdTe infrared focal plane array

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Abstract In this study, crosstalk suppressing design of dielectric GaAs microlenses integrated on a traditional HgCdTe infrared focal plane array is presented, by exploiting the finite difference time domain technique. Responsive photocurrent of the objective pixel and crosstalk between adjacent detectors have been numerically simulated, using commercial TCAD software *Apsys*, for a mid-wavelength planar array with a pitch of 20μm. By properly adjusting both the microlens radius and the absorber thickness, crosstalk can be notably suppressed to less than 1 % while the photoresponse is maintained or even enhanced.

Keywords Microlens · IRFPA · Crosstalk suppressing · FDTD method

1 Introduction

The mercury cadmium telluride (HgCdTe) alloy has become one of the most important and widely used material systems among others (Guo et al. 2011, 2012) for infrared (IR) imaging applications, since its first synthesis in 1958 (Rogalski 2005; Hu et al. 2009, 2011, 2012; Yin et al. 2009; Ye et al. 2011; Wang et al. 2011; Chen et al. 2012; Li et al. 2012). The third generation HgCdTe IR detectors at present, despite no distinct definition, are commonly believed to feature large-format arrays, high operating temperature, multi-color detection and other flexible capabilities (Rogalski 2003). Unfortunately, as the pixel dimension is continuously reduced to achieve higher resolution, IRFPA detectors encounter a decreased optical efficiency as well as an increased spatial crosstalk. Large crosstalk may cause misleading signals at adjacent pixels, resulting in degraded device performance and illegible output images.

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