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Study of Schottky contact in HgCdTe infrared photovoltaic detectors

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Abstract The changed polarity of transient photovoltage (TPA) from negative to positive induced by ultra fast lasers illumination is studied in the HgCdTe p-n junction photovoltage detector. The negative photovoltaic-response decrease obviously and even disappear by blocking the laser beam with an aperture to limit the illumination area of the linear array detectors. This new phenomenon can be explained by a combined theoretical model of p-n junction and Schottky contact. Using the TPA technique and the combined model, the characters of p-n junction and Schottky contact will be distinguished. Therefore, it could be used in characterizing the Ohmic contact of the detectors electrodes, and its sensitivity is expected to be much higher than the steady states methods.

Keywords HgCdTe · Transient photovoltage · Polarity change · Schottky contact

1 Introduction

Since the first synthesis in 1958, HgCdTe infrared detectors have been intensively developed over the past fifty years (Hu et al. 2011, 2009, 2011). In a pixel of the linear array of HgCdTe photovoltaic detectors, the photo-generated carriers separated by the p-n junction will be injected in the readout circuit from HgCdTe-metal interface (Chen et al. 2012; Hu et al. 2010). Therefore, for the n^+-on-p backside illuminated hybrid linear array detectors, the electrodes preparation is one of the most important issues influencing the detectors performance. Generally, a coupled of methods have been devoted to characterizing the Ohmic contact of the detectors electrodes (Mikhelashvili et al. 1999; Lee et al. 2006). Most of the methods are using steady-state electric testing techniques, such as I-V, C-V test. However, the signals of HgCdTe-metal interface and p-n junction are in superposition with each other in the electric steady-state testing. As a powerful tool to investigate the electric property of the

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