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Title:A new scheme for sensitive detection of terahertz photons
Authors:Wang, Zhihai (1); Nakajima, Takashi (1); Matsuda, Shinpei (1); Komiyama, Susumu (1)
Author affiliation:(1) Department of Basic Science, University of Tokyo, Komaba 3-8-1, Meguro-ku, Tokyo 153-8902, Japan
Corresponding author:Wang, Z.(zwang@riken.jp)
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Abstract:Charge sensitive infrared photo transistors (CSIPs) made in GaAs/AlGaAs bilayer two-dimensional electron systems (2DESs) serve as sensitive photodetectors in the mid- and long-wavelength infrared regions. A new design of CSIP is proposed to expand the wavelength range to longer wavelengths (λ > 36 μm). Remarkably improved detector performance is demonstrated for λ &asyum; 39 μm. In CSIPs electrons are photo-excited in a floating gate (FG) served by an isolated region of upper layer 2DESs. In the new design (i) a bow-tie antenna couples incident radiation to an FG far smaller in size (2-3 μm) than the wavelength and (ii) excited electrons 'laterally' escape from the FG via tunneling through a barrier formed by biased metal cross gates. The charge state of the FG is sensed by a source-drain channel in the lower layer of the 2DES. The sensitivity and the quantum efficiency have been greatly improved, indicating that CSIPs are promising detectors in an expanded wavelength range exceeding 36 μm. © 2013 IOP Publishing Ltd.
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