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Surface plasmon enhanced IR absorption: Design and experiment

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Abstract

Metal corrugated surfaces have the potential of enhancing optical absorption through surface plasmon (SP) excitation facilitated by light-metal interactions. The successful utilization of metal corrugation induced optical absorption can improve the response of free carrier absorption (FCA), based HEterojunction Interfacial Workfunction Internal Photoemission (HEIWIP) detectors. This article reports theoretical and experimental investigations of SP-induced infrared (IR) absorption in GaAs based structures, exhibiting absorption peak wavelength (λ_p) in the 10–14 μm region. Moreover, substantial absorption and responsivity improvement using metallic corrugation on typical heterojunction detector is predicted. Proposed design and optimization approaches will be useful for improving the performance of IR detectors.