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Mid/Far-Infrared Photoetection via Second-Order Nonlinear-Susceptibility in Semiconductor Heterostructures[1] ALEKSANDER WOJCIK, FENG XIE, ALEXEY BELYANIN, Texas A&M University — Photodetectors in the mid/far-infrared spectral regions have always presented a challenge stemming from the need to use narrow bandgap materials and inevitably high dark current due to thermal excitations that limit the overall performance of the detector. We propose a nonlinear infrared photodetection scheme based on coherent frequency up-conversion in coupled quantum-well heterostructures, which would permit to take advantage of superior properties of GaAs-based and InP-based materials, and at the same time utilize the well developed photodetector technology at the near-infrared and visible wavelengths. Our analysis includes specific structures and device designs, including the expected performance of such detectors. We show the possibility of single-photon detection in the mid-infrared range with high detection efficiency. We also discuss possibility of monolithically integrating up-conversion detectors with near-IR semiconductor pump lasers, which would yield a compact injection-pumped device.

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