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Self-assembled ErAs nanoislands for enhanced terahertz detection. JOHN O'HARA, ROHIT PRASANKUMAR, Los Alamos National Laboratory, JOSH ZIDE, ART GOSSARD, University of California-Santa Barbara, ANTOINETTE TAYLOR, RICHARD AVERITT, Los Alamos National Laboratory — Traditionally, THz detectors based on photoconductive (PC) antennas have utilized low-temperature grown GaAs (LT-GaAs) and radiation-damaged silicon-on-sapphire (RD-SOS) due to their fast carrier trapping times. However, the development of self-assembled ErAs nanoislands embedded in a GaAs matrix offers a particularly useful alternative for THz PC devices based on the ability to independently tune photo-excited carrier lifetimes, trap density, and dark resistance. In this work, we demonstrate enhanced THz detection using self-assembled ErAs:GaAs nanoisland structures. Three nearly identical THz PC antenna detectors are fabricated; one each on the LT-GaAs, RD-SOS, and ErAs:GaAs substrates. Their performance in a typical THz time-domain spectroscopy system is compared in terms of optical efficiency, bandwidth, and saturation behavior. Carrier lifetimes in all three substrates are also compared via pump-probe techniques.

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