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Title

Nano Antenna Array for Terahertz Detection

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Abstract

Infrared (IR) detectors have been fabricated consisting of antenna-coupled metal-oxide-metal diodes (ACMOMDs). These detectors were defined using electron beam lithography with shadow evaporation metal deposition. They are designed to be sensitive to the IR range and work at room temperature without cooling or biasing. In order to achieve large arrays of ACMOMDs, nanotransfer printing have been used to cover a large area with metal-oxide-metal (MOM) diodes and with antenna structures. The printed antenna structures consist of gold and aluminum and exhibit a low electrical resistivity. A large area array of MOM tunneling diodes with an ultrathin dielectric (~ 3.6-nm aluminum oxide) has also been fabricated via the transfer-printing process. The MOM diodes exhibit excellent tunneling characteristics. Both direct and Fowler-Nordheim tunneling has been observed over eight orders of magnitude in current density. Static device parameters have been extracted via kinetic Monte Carlo simulations and have confirmed the existence of a dipole layer at the aluminum/aluminum oxide interface of the printed tunneling diodes. The mechanical yield of the transfer-printing process for the MOM tunneling diodes is almost a 100%, confirming that transfer printing is suitable for large area effective fabrication of these quantum devices. (36 References).