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Thermoelectrically Coupled Nanoantennas for Circularly-Polarized Light and Angle of Incidence Detection

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Abstract

We are developing a new class of infrared-to-THz sensor based on nanoantennas and nanothermocouples. These thermoelectrically coupled nanothermocouples (TECNAs) comprise a nanoantenna coupled to a nanothermocouple, the output of which is greatly enhanced when suspended over a cavity etched into a silicon substrate. The cavity serves to both thermally insulate the antenna/thermocouple system and to concentrate light onto the antenna. TECNAs possess a range of desirable features including very fast response times (well into the 100's of kHz due to their extremely small thermal mass), sensitivity to either linear or circular polarization, angle-of-incidence sensitivity, room-temperature operation, and wavelength selectivity. We have demonstrated their TECNA operation from 5.5 to 500 microns and will provide details of their fabrication, testing, and performance for both linear and circularly polarized mid-infrared light, as well as compare simulations and experiments of their far-field radiation patterns.