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Nanoscale rectenna for broadband rectification of light from infrared to visible[1] DARIN ZIMMERMAN, JAMES CHEN, MICHAEL PHILLIPS, DENNIS RAGER, ZACHARY SINISI, RAYMOND WAMBOLD, GARY WEISEL, BROCK WEISS, The Pennsylvania State University, Altoona, BRIAN WILLIS, The University of Connecticut, Storrs, NICHOLAS MISKOVSKY, Scitech Associates, LLC — We describe a novel approach to the efficient collection and rectification of solar radiation in a device designed to operate from the infrared through the visible. Here, a nanoscale, rectenna array acts both as an absorber of incident radiation and as a rectifier. Rectification derives not from temperature or material asymmetry, as with metal-insulator-metal or silicon-based, Schottky diodes. Instead, it derives from the geometric asymmetry of the rectenna, which is composed of a pointed tip and a flat collector anode. In this arrangement, the difference between the potential barriers for forward and reverse bias results in a rectified dc current. To achieve anode-cathode gap distances within the tunneling regime, we employ selective atomic-layer deposition of copper applied to palladium rectenna arrays produced by electron-beam lithography. We present details of device fabrication and preliminary results of computer simulation, optical characterization, and electro-optical response.

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