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Solution-biased measurements and simulation of extraordinary electroconductance in Ti-GaAs hybrid structures[1] W.-J. CHANG, H.-J. SUK, R. BASHIR, University of Illinois at Urbana-Champaign, A.K.M. NEWAZ[2], S.A. SOLIN, Washington University in St. Louis — This study addresses the design, fabrication, characterization and simulation of a new type of sensor using the extraordinary electroconductance (EEC) effect [1] in a microscopic metal-semiconductor hybrid (MSH) structure at room temperature for real time detection of an external electric field. Three electron beam lithography steps were used to fabricate a 5 micron by 5 micron MSH device that contains a Ti/Au shunt forming a Schottky junction with a GaAs epitaxial layer. When the external electric field was applied by biasing the phosphate buffered saline solution on top of the nitride insulating layer deposited on the sensor, MSH structures showed higher sensitivity than bare semiconductor structures that do not have the metal shunt. A maximum EEC effect of 13.7 percent was observed from the MSH structure for an applied external electric field of -46.6 V/cm. It should be possible to use scaled-down nanoscopic EEC sensor arrays as a novel device for real time imaging of the surface charge distribution of a single cell.

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