Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Photoinduced modification of surface states in nanoporous InP observed by terahertz spectroscopy JAMES LLOYD-HUGHES, University of Oxford, Department of Physics, SUSANNE MUELLER, GIACOMO SCALARI, ETH Zurich, Institute for Quantum Electronics, HUGH BISHOP, ALISON CROSSLEY, University of Oxford, Department of Materials, MIHAI ENACHI, LILIAN SIRBU, ION TIGINYANU, Technical University of Moldova — A precise control of the surface properties of semiconductor nanomaterials is vital for their functionality and use in many opto-electronic applications. Terahertz time-domain spectroscopy allows the non-contact investigation of electron transport in semiconductor nanomaterials, without the complication of contact fabrication. The technique allows the photoconductivity to be determined on picosecond timescales, under the assumption that the material's properties are not permanently altered by photoexcitation. Here we demonstrate that this assumption is not always valid. We report an investigation of nanoporous honeycombs of n-type InP using terahertz time-domain and X-ray photoemission spectroscopies. After photoexcitation the dark conductivity was found to increase quasi-irreversibly, recovering only after several hours in air. The calculated electron density for different surface pinning energies suggests that photoexcitation may reduce the density of surface states. The photoinduced modification of porous semiconductors may be useful in material processing as it is a clean, dry, and area-selective method to increase the conductivity.

James Lloyd-Hughes
University of Oxford

Date submitted: 11 Nov 2011 Electronic form version 1.4