

Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Towards optically-integrated scanning tunneling microscopy studies of defects in semiconductors ANNE BENJAMIN, EVAN LANG, KEVIN WERNER, ENAM CHOWDHURY, JAY GUPTA, Ohio State Univ - Columbus — As electronic devices approach the nanoscale, their function is increasingly dependent on the local environment of individual defects. We are developing a combination of optical illumination and scanning tunneling microscopy techniques to study how the properties of individual defects depend on aspects of the local environment, such surface or defect proximity, applied electric fields, and illumination. Here we present studies of individual Zn and Er impurities in GaAs(110).

We use controlled motion of the STM tip during voltage sweeps to resolve previously hidden in-gap states of Zn acceptors and probe Zn further from the surface than previously accessible. We discovered two classes of Zn acceptors, one with defect states that did not shift with tip-induced band bending (TIBB), and one with states that do. Similar behavior was observed for above-gap illumination, consistent with the surface photovoltage effect (SPV). For Er on GaAs(110), we discovered three different adsorption states sharing two different sites. We found defect states near the conduction band edge, which shifted with TIBB as well as IR illumination resonant with the Er f-shell transitions.

Anne Benjamin
Ohio State Univ - Columbus

Date submitted: 06 Nov 2015

Electronic form version 1.4