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Profiling the local carrier concentration and dopant distribution across a semiconductor quantum dot J.C. WALRATH, A.S. CHANG, Y.H. LIN, S. HUANG, R.S. GOLDMAN, Univ of Michigan - Ann Arbor — We profile the local carrier concentration, n, across epitaxial InAs/GaAs quantum dots (QDs) consisting of 3D islands on top of a 2D alloy layer. We use scanning thermoelectric microscopy to profile the temperature gradient-induced voltage, which is converted to a profile of the local Seebeck coefficient, S. The S profile is then converted to a conduction band-edge profile and compared with Poisson-Schrodinger band-edge simulations. Our combined computational-experimental approach suggests a reduced carrier concentration in the QD center in comparison to that of the 2D alloy layer. We further use 3D atom probe tomography, which enables 3D imaging with a few Angstrom resolution, to profile the distribution of Si dopants. We discuss the correlation between the Si dopant distribution and the observed carrier concentration profile.

Jenna Walrath
Univ of Michigan - Ann Arbor

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