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Improved Simulation of Charged Defect Profiles in Scanning Tunneling Microscopy Images GEOFFREY W. BROWN, MARILYN E. HAWLEY, Materials Science and Technology Div. (MST-8), Los Alamos National Laboratory, Los Alamos, NM 87545 — Scanning tunneling microscopy is often used to study charged defects at semiconductor surfaces. Charge-induced band bending affects the local tunnel current by changing the electronic state density between tip and sample Fermi levels. Imaging is usually carried out under constant current feedback conditions with adjustable tip-sample spacing and a constant tunnel gap voltage. In order to understand the defects, surface profiles through the defect screening regions are often simulated using either standard tunneling theory or a scattering theory approach. These produce qualitative agreement with observations but could be improved by using a more accurate form of the electrostatic potential and by self-consistently calculating the band bending, screening length, and resulting tip response under constant current conditions at each point along the profile. We have done this calculation for the tunneling theory approach. We will describe the details of the calculation and then show the results of applying it to charged features near GaAs(110) surfaces.

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