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Effect of hydrogen on surface electron accumulation in InN films

RUDRA BHATTA, BRIAN THOMS, MUSTAFA ALEVLI, NIKOLAUS DIETZ, Georgia State University — Effect of hydrogen on electron accumulation in InN films has been studied by high resolution electron energy loss spectroscopy. N-H loss features are observed in the HREEL spectra from the InN surface after atomic hydrogen cleaning. Heating for 30 s at 500°C results in the disappearance of all adsorbate loss features indicating desorption of hydrogen and production of a bare InN surface. HREEL spectra taken from both bare and hydrogenated surfaces show a broad loss feature due to conduction band plasmon excitations. As the incident electron energy is decreased from 35 to 7 eV, which results in shorter penetration depths and increasing surface sensitivity, the energy of plasmon loss feature increases by 600 cm^{-1} in spectra from both the bare and hydrogenated surfaces. The increase in plasmon loss energy with increasing surface sensitivity indicates higher carrier concentration on the surface, i.e. surface electron accumulation. This demonstrates that surface electron accumulation exists in the absence of surface indium overlayers or droplets and is unaffected by surface hydrogen adsorption.

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