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Surface Fermi level and surface state density in GaAsSb surface intrinsic-n^+ structures by photoreflectance spectroscopy[1] KUANG-I LIN, JUNG-TSE TSAI, MING-HSUN LEE, Department of Physics, National Cheng Kung University, Tainan, Taiwan, PEI-CHIN CHIU, SHU-HAN CHEN, JEN-INN CHYI, Department of Electrical Engineering, National Central University, Chung-Li, Taiwan, JENN-SHYONG HWANG — The III-V ternary semiconductor GaAsSb has recently attracted considerable attention as the base layer of the high speed heterojunction bipolar transistors (HBT). Performance optimization of the HBT requires a precise determination of the surface state density and the surface Fermi level position of the GaAsSb alloy, but few such determinations have been reported. In this work, photoreflectance is employed to investigate the Fermi level pinning and the surface state density of a $GaAs_{0.65}Sb_{0.35}$ surface intrinsic-n^+ (SIN^+) structure based on the thermionic emission theory and the current-transport theory by the dependence of surface barrier height on the pump beam intensity. The surface state density is estimated as approximately 1.91 x 10^{13} cm^{-2}, and the Fermi level is located 0.63 eV below the conduction band edge at the surface. The high surface state density leads the surface Fermi level to be strongly pinned within the bandgap demonstrated by sequential etching of the intrinsic layer.

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Jenn-Shyong Hwang
Department of Physics, National Cheng Kung University

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