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High Resolution Investigation on the NiAu Ohmic Contact to *p*-AlGaIn/GaN Heterostructure

© Zheng-Fei Hu¹, Xiang-Yang Li², Yan Zhang²

¹ School of Materials Science and Engineering, Tongji University, Shanghai, China

² Key Laboratory of Infrared Imaging Materials and Detectors, Shanghai Institute of Technical Physics, Chinese Academy of Sciences, Shanghai, China

E-mail: huzhengf@tongji.edu.cn

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The low-resistance ohmic contact NiAu/*p*-type AlGaIn/GaN was carefully investigated by high resolution electron microscope (HRTEM) and *X*-ray photoelectron spectroscopy (XPS) after two-step annealing at 550°C and 750°C. It is shown that complicate double-direction diffusion and reaction occur in the metal layer and underlying GaN layer. The stacks of Ni|Au|Ni|Au turn into one alloyed layer and an intimate relationship establishes at the NiAu/GaN boundary which should play a primary role in ohmic contact to lower the contact barrier. A great part of Ni is oxidized as dispersive NiO nanoclusters in the metal layer, which might have an effect to hinder Ga atoms migrating upward. So at the intimate interface, the metal layer close to the contact enriched with Ga and Au, and the GaN upper layer metallized by Au and Ni should reduce the lattice mismatch and the contact barrier. Dense vacancies in the upper GaN layer and dislocations connected with the contact boundary also have the effects to improve the current carrier transportation. So the low ohmic contact to *p*-GaN should be obtained by the combination of these microstructural characteristics.

Keywords: AlGaIn, ohmic contact, microstructure, XPS, HRTEM.