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Surface Analysis of $(\text{NH}_4)_2\text{S}_x$ -treated InGaN using X-ray Photoelectron Spectroscopy

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Abstract

We present the surface analysis of $(\text{NH}_4)_2\text{S}_x$ -treated InGaN using x-ray photoelectron spectroscopy. The native oxide and organic contamination on the InGaN surface can be removed by $(\text{NH}_4)_2\text{S}_x$ surface treatment. However, the hydroxyl species present on the InGaN surface cannot be removed. Because Ga-S and In-S bonds were formed and N-S bonds were not observed, we deduce that the sulfur atoms would occupy the nitrogen-related vacancies and bond with the Ga and In atoms. The clean surface and surface state reduction caused from the $(\text{NH}_4)_2\text{S}_x$ surface treatment would be useful for the formation of ohmic and Schottky contacts between the metal and InGaN layers.

Keywords : Indium compounds; Gallium compounds; III-V semiconductors; Wide band gap semiconductors; Surface composition; Surface treatment; X-ray photoelectron spectra; Surface contamination; Bonds (chemical); Ohmic contacts; Schottky barriers; Surface cleaning; Ammonium compounds; Vacancies (crystal)