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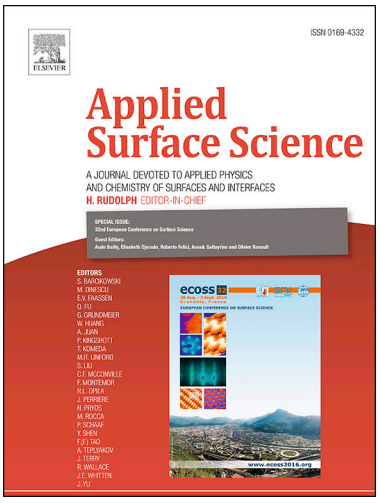

Full Length Article

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Angular dependent XPS study of surface band bending on Ga-polar *n*-GaN

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Abstract

Surface band bending and composition of Ga-polar *n*-GaN with different surface treatments were characterized by using angular dependent X-ray photoelectron spectroscopy. Upward surface band bending of varying degree was observed distinctly upon to the treatment methods. Besides the nitrogen vacancies, we found that surface states of oxygen-containing absorbates (O-H component) also contribute to the surface band bending, which lead the Fermi level pined at a level further closer to the conduction band edge on *n*-GaN surface. The *n*-GaN surface with lower surface band bending exhibits better linear electrical properties for Ti/GaN Ohmic contacts. Moreover, the density of positively charged surface states could be derived from the values of surface band bending.

Keywords: GaN, Band bending, Surface state, ADXPS, Oxygen-containing absorbate

1. Introduction

Large polarization in III-nitride materials results in bound polarization charges on surfaces [1], which give rise to a distribution of compensating electron states to satisfy the charge neutrality. These compensating states, including internal ionized states and external surface states, affect the internal electric field near the surface and play a crucial role in electric properties of these materials [2]. The external surface states [3] can be surface vacancies, dangling bonds, structural defects, surface oxides, or