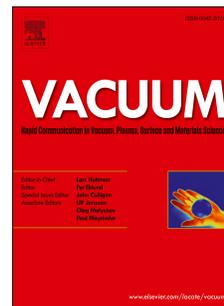


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# AlN/nitrided sapphire and AlN/non-nitrided sapphire hetero-structures epitaxially grown by pulsed laser deposition: a comparative study

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**Abstract:** AlN/nitrided sapphire and AlN/non-nitrided sapphire hetero-structures epitaxially grown by pulsed laser deposition (PLD) have been carried out. The characterizations find that when the nitridation process is implemented on sapphire substrates, the properties of AlN/sapphire hetero-structures are improved significantly. It is also identified that very smooth AlN surface with the root-mean-square surface roughness of 1.5 nm, full-width at half-maximums for AlN(0002) and AlN(10-12) X-ray rocking curves of 0.59° and 0.91°. Abrupt AlN/sapphire hetero-interfaces are obtained in AlN/nitrided sapphire hetero-structures. These high-quality AlN/nitrided sapphire hetero-structures shed light for the fabrication of highly-efficient AlN/nitrided sapphire-based devices.

**Keywords:** epitaxial growth, AlN, nitridation, sapphire, PLD.

## 1. Introduction

Nowadays, III-nitrides, such as, AlN, GaN and InN, have attracted considerable attentions due to their superior properties for the application of optoelectronics.<sup>1-3</sup> Among the III-nitrides, AlN has high thermal conductivity, high temperature stability, direct band, high surface acoustic wave velocity, *etc.*, which make it feasible for the manufacture of surface acoustic wave devices, short wavelength emitters,

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