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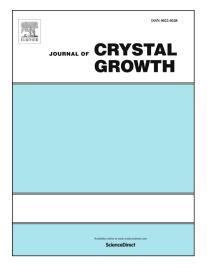
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## ACCEPTED MANUSCRIPT

# Properties of AlN layers grown on c-sapphire substrate using ammonia assisted MBE

Samuel Matta <sup>a, b,\*</sup>, Julien Brault <sup>a,\*</sup>, Maxim Korytov <sup>a</sup>, Thi Quynh Phuong Vuong <sup>b</sup>, Catherine Chaix <sup>c</sup>, Mohamed Al Khalfioui <sup>a</sup>, Philippe Vennéguès <sup>a</sup>, Jean Massies <sup>a</sup>, and Bernard Gil <sup>b</sup>

<sup>a</sup> Université Côte d'Azur, CNRS, CRHEA, 06560 Valbonne, France

<sup>b</sup> Université de Montpellier, L2C, UMR 5221, 34095 Montpellier Cedex 5, France

<sup>c</sup> RIBER SA, 31 rue Casimir Perier, 95873 Bezons, France

#### **Abstract**

AlN epilayer properties (120 nm thick) grown by ammonia assisted molecular beam epitaxy on c-sapphire substrates with different low temperature AlN buffer layers (LT-BL) have been studied. The role of the LT-BL on the AlN structural and optical properties was investigated as a function of the LT-BL thickness and growth temperature. Optimum growth conditions were identified with LT-BL thickness of 3 nm and growth temperature between 480°C and 520°C. It was shown that by optimizing these conditions, a reduction of both mixed and edge threading dislocation densities up to 75 % is achieved. The impact of the growth temperature of the AlN epilayer was also studied showing an additional improvement of the AlN crystal and morphological properties while growing at higher temperature. A correlation between the epilayer strain and the PL emission was also investigated. Finally, an Al<sub>0.7</sub>Ga<sub>0.3</sub>N:Si doped layer was grown on the top of the optimized AlN template showing a smooth surface with monoatomic steps and a roughness ~ 0.2 nm, confirming the potential of such templates for the fabrication of AlGaN based heterostructures.

<sup>\*</sup>Corresponding authors. E-mail addresses: sm@crhea.cnrs.fr (S. Matta); jb@crhea.cnrs.fr (J. Brault)

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