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THE GROWTH OF AlN SINGLE LAYER ON SAPPHIRE AT LOW PRESSURE USING METALORGANIC CHEMICAL VAPOR DEPOSITION (MOCVD)

Mohd Ann Amirul Zulffiqal Md Sahar[1,*], Zainuriah Hassan[1], Way Foong Lim[1], M.E.A. Samsudin[1], A.M. Hanafiah[1], Yusnizam Yusuf[1], M.A. Ahmad[1], Nur Atiqah Hamzah[1], Rahil Izzati Mohd Asri[1]

[1]Institute of Nano Optoelectronics Research and Technology (INOR), Universiti Sains Malaysia, 11800 USM, Penang, MALAYSIA.

(E-mail: annamirul93@gmail.com, zai@usm.my, way_foong@usm.my)

ABSTRACT- In this work, AlN single layer has been successfully grown on c-plane sapphire using metalorganic chemical vapor deposition (MOCVD) at low reactor pressure. The effects of growth temperature, ammonia (NH_3) flux and trimethylaluminum (TMAl) flux towards AlN growth were investigated. It was noted that the reaction between NH_3 and TMAl has affected the growth rate across the growth temperature. Field emission scanning electron microscopy (FESEM) equipped with Energy-dispersive X-ray (EDX) have revealed the formation of AlN single layer on the sapphire substrate and elemental composition of the layer, respectively. The dependence of growth rate on growth temperature, TMAl flux and NH_3 flux was observed. It could be related to the occurrence of parasitic reaction as a result of theunintentional formation of AlON composition in the AlN layer. A relationship was drawn, whereby an increase in TMAl flux and decrease in NH_3 flux would lead to an increase in the AlN growth. In addition, a drastic increase in the AlN growth was observed at high growth temperature, which was more than 1000°C. Further characterization was carried out using atomic force microscopy (AFM) and phase analysis using X-ray diffraction system (XRD).

Keywords: AlN, MOCVD, growth rate, TMAl, NH_3.