

14<sup>th</sup> International Conference and Exhibition on

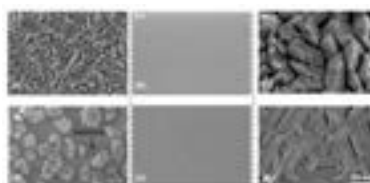
# MATERIALS SCIENCE AND ENGINEERING

November 13-15, 2017 | Las Vegas, USA

## Effect of TMAI pretreatment of sapphire substrate on the properties of MOCVD grown AlN epilayers

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The growth of high quality AlN epitaxial films relies on precise control of the initial growth stages. In this work, we investigated the influence of trimethylaluminum (TMAI) pretreatment of sapphire substrates on the properties, impurity incorporation and growth mode change of AlN films grown by metalorganic chemical vapor deposition (MOCVD). Without the pretreatment, no trace of carbon was found at AlN/sapphire interface and the residual oxygen resulted in N-polarity. With 5s pretreatments, carbon started to be incorporated, forming scattered carbon-rich zones due to the decomposition of TMAI. It was discovered that carbon attracted surrounding oxygen impurity atoms and consequently, suppressed the formation of N-polarity. With 40 s pretreatment, a significant presence of carbon clusters at the AlN/sapphire interface occurred, which attracted considerable co-existed oxygen. While preventing the N-polarity, the carbon clusters served as random masks to further induce a 3D growth mode, creating Al-polar AlN nanocolumns with different facets. The properties of AlN and epitaxial growth mode change are discussed



SEM plan-view images of morphological changes of Samples 1, 2 and 3, including (a) - (c) before and (d) - (f) after MOCVD, respectively

### Biography

Prof. Al tahtamouni is an associate professor at Department of Material Science and Technology in Qatar University. His research mainly concentrates on design, material growth and property study of III-nitride-based deep UV optoelectronic devices. He conducted the research on design, growth and testing of deep-UV light-emitting diodes (LEDs) and MOCVD growth of polar and nonpolar Group-III nitrides epilayers and quantum well structures. He also received many awards and honors, such as DFG Fellowship Research grant at Ulm University and Fulbright Research Award at Texas Tech University. Al tahtamouni's research work on deep ultra violet materials and device structures resulted in a series of technical publications in the world leading journals and conferences. Many of his papers have been published in Applied Physics Letters, widely considered one of the top international journals in this research area.

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