S1-P.40

X-Ray Photoelectronic Spectroscopy of GaN, AlGaN layers, Grown on Silicon by the Chemical Transport Reactions Method.

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Thin layers of GaN, and AlGaN were synthesized on Silicon substrates by chemical transport reactions method in the system (H_2-NH_3-HCl-Al-Ga).The composition of surface layers was studied by X-ray Photoelectron Spectroscopy Method. Besides Nitrogen, Aluminum, and Gallium, there were found also other elements - Carbon, and Oxygen in the atomic composition of layers. It was found a lower concentration of oxygen atoms in the composition of GaN layers deposited at relatively lower temperatures. It is assumed that the presence of Oxygen in the composition of layers is partly due to the decomposition of quartz glass, which the reactor is made from at high temperatures. It was found that atomic concentration of Gallium in AlGaN layers is much less than the Aluminum concentration, despite of the fact that the concentrations of Gallium and Aluminum precursors in the gaseous flow at the entrance in the synthesis zone were in equimolecular ratio. This demonstrates that the rate of chemical reactions of the ammonia with gaseous components of the Aluminum is significantly greater than with that of the Gallium. Therefore, the latter are removed by the gas stream from the growth zone.