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Role of NH_3 Annealing Treatment in Improving ScN Layer on GaAs Substrate Using Electron Beam Evaporator

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In this work, the growth of scandium nitride (ScN) on gallium arsenide (GaAs) substrate is demonstrated using electron beam (e-beam) evaporator with successive annealing in ammonia (NH_3) ambient. As observed in field effect scanning electron microscopy (FE-SEM), the surface morphology of the ScN layer was started to transform from rice grains-like structure to rock salt grains-like structure by increasing the temperature from 750 °C to 900 °C. The rock salt grains-like structure is similar to high quality ScN, as reported in literature. However, the surface degraded with the presence of voids at 980 °C. The existence of ScN bond was confirmed by x-ray photospectroscopy (XPS) measurement. The photoluminescence (PL) of near-to-band-edge ScN peak was observed in all samples. Furthermore, the ScN peaks in Raman spectrum were obvious when the sample was annealed above 850 °C. Based on the evidences, the growth of ScN using the above techniques was successful, with the annealing temperature above 850 °C.