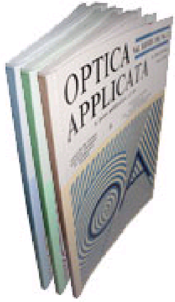

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Problems with cracking of $Al_xGa_{1-x}N$ layers

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Keywords

$Al_{0.4}Ga_{0.6}N$, GaN, Si doping

Abstract

$Al_xGa_{1-x}N$ is a wide band-gap material, which can be used for manufacture of UV detectors. Unfortunately, there are problems with the cracking of those layers occurring above some critical thickness, which is a bit smaller from the one used for detectors (about 1 μm). Our investigation concentrated on the causes of crack formation. To avoid it we used so-called special AlN nucleation layer, which was to stop the relaxation. We obtained a strained layer free of cracking, but with a very big number of dislocations. We compared dislocation densities of strained and relaxed $Al_{0.4}Ga_{0.6}N$ layers. The first one was characterized by a higher dislocation density than the second one. We also investigated the problem with cracking occurring in $Al_{0.4}Ga_{0.6}N$ epitaxial layers during the doping, and how to control this process. The relaxation of the layers started for very low impurity densities and went on when we increased the amount of the dopant.

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Back to list

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