Nanocomposites and nanomaterials

The processes of deformation relaxation in GaN/Si nanowires

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Recently, GaN nanowires (NWs) have attracted large interest as a new building block for nano-sized optoelectronic devices, sensors, lasers, etc. One of the advantages of NWs, which usually are grown on foreign substrates, is smaller deformation magnitude in comparison with planar structures. At the same time, the process of deformation relaxation is not completely studied. Exponential deformation relaxation in etched GaN NWs grown on Al_2O_3 and Si substrates was demonstrated in work [1]. Also, the same deformation behavior along the growth direction was shown for etched GaN nanopillars [2].

Deformation distribution along NWs leads to broadening, shift and asymmetry of 2θ-ω X-ray diffraction profile (XDP). Therefore, theoretical modeling of the XDP allows us to find such parameters as size and deformation profiles of NWs. To describe the deformation profile along growth direction in GaN NWs we analyze the changes of vertical lattice parameter as a function of their height. For calculating symmetrical (0002) 2θ-ω XDP of GaN NWs we used kinematical theory of X-ray diffraction. This approach allows us to obtain directly from symetrical XDP such parameters of NWs as their height and lattice constant fluctuation along growth direction [3]. The deformation behavior in GaN NWs have been demonstrated,

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