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Growth and characterization of GaN epilayer grown on on-axis Si (100) substrate by metalorganic chemical vapor deposition

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This presentation will be in two parts: In the first part, we shall look at a facile method for reducing the threading dislocation density (TDD) in GaN epilayer grown on on-axis Si(100) substrates without the use of complex compensating and interlayers. On-axis substrates are used in this work CMOS compatibility reasons. We report on the reduction of threading dislocation density (TDD) of GaN epilayer grown on the {111} exposed surface of a V-groove formed on Si(100) substrates by metalorganic chemical vapor deposition (MOCVD). The V-grooves were either aligned parallel or misoriented at an angle α ($\alpha=2, 4$ or 6) towards the $\langle 011 \rangle$ crystallographic direction. The intentional introduction of misorientations of the masked trenches resulted in steps and terraces on the exposed {111} surface. It is found that the full width at half maximum (FWHM) of both out-of-plane (0002) and in-plane (10-11) rocking curves of GaN grown on the 6 \circ misoriented groove template was narrower by a factor of 2 compared to the other samples indicating a reduction in both screw and edge dislocation densities (TD). The lithographically defined grooves are defined as either discontinuous or continuous based on whether there are spaces separating the grooves or not. Raman scattering results revealed that, GaN grown on the discontinuous V-grooved samples was unintentionally doped with free carriers from the SiN_x mask, resulting in the disappearance of the A1(LO) phonons mode. Transmission electron microscopy (TEM) results corroborated TDD reduction of GaN grown on the 6 \circ misoriented groove template via dislocation bending towards the edge facets of the 3D AlN buffer islands that nucleated on the vicinal Si{111} interface. Vicinal surface with step height (~ 19 nm) and terrace length (~ 450 nm) of certain geometric parameters are found to be effective in reducing the total TDD in GaN epilayer. The second part of the presentation focuses on the growth of semi-polar GaN on on axis Si(100) substrate. We present results obtained in our research group on the growth of GaN on Si(100) substrates with different template patterns. The crystal quality was investigated by high resolution X-ray diffraction (HR-XRD) and the morphology of the as-grown GaN was characterized by scanning electron microscope (SEM), atomic force microscope (AFM) and optical microscope. The optical properties are studied by Raman scattering and photoluminescence spectroscopy. Finally but not least, the threading dislocation density within the GaN was investigated by transmission electron microscope (TEM).

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Nanoparticles in humans: Experiments, methods and strategy

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Problem of the nanoparticles exposure in general form. Nanoparticles Dosimetric Road Map as a general strategy for the assessment of the dose, which is a main cause of the health effect in nanoparticles exposure. Unattached radon progeny was used as an experimental tool for the study of airborne nanoparticles. Unattached radon progeny was used as a safe and useful experimental tool to study the effect of nanoparticles exposure on human beings.

Biography

Lev S Ruzer is working as a visiting researcher in the Indoor Environment Department, Environment Energy Technologies Division Lawrence Berkeley National Laboratory, USA. He earned all his degrees and titles in the former USSR: Candidate of physico-mathematical sciences (equivalent to PhD) in Moscow Engineering-Physical Institute (MEPHI) in 1961; Doctor of Technical Sciences in the Institute of Physico-Technical and Radio technical Measurements (VNIIFTRI) 1971; The title of Professor in 1977 (VNIIFTRI). He is the author of 3 books, editor of 1 book and now preparing the second edition of this book (Taylor & Francis). He has about 8 years of teaching experience.

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