Nanostructures for the next generation of semiconductor devices

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Abstract: In this presentation we discuss motivations for studying nanostructures and review our recent results obtained in collaboration among several groups. It has been documented that the properties of nanostructured materials may be employed to enhance the performance of various devices. Therefore, it is of great importance to understand the basic properties of such materials. We believe that our expertise acquired in this filed will significantly contribute to the broad fund of knowledge that is prerequisite for successful design and engineering of new generation of devices.
We shall review several methods used to create nanostructures such as PVD on different substrates, magnetron sputtering of superlattices using different materials, and pulsed laser ablation in different atmospheres. We have shown that even macroscopic studies such as XRR provide a valuable information on the self-assembly processes[1]. Another key question is self-organization. A full success of the superstructure method for the nanostructure formation is demonstrated although a lot of open questions remain in the realm of structural decomposition, diffusion and self-assembly. It is clear that a more detailed knowledge of the interplay of defects and self-assembly process is required. It will be shown that in specific cases a high degree of self-assembly can be obtained, which means that some expensive lithography steps in processing could be avoided[2]. Further details on structural optical and electric properties will be presented and discussed.

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