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One dimensional nanostructured materials

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Abstract

The quest for materials with molecular scale properties that can satisfy the demands of the 21st century has led to the development of one dimensional nanostructures, ODNS. Nearly, every class of traditional material has an ODNS counterpart. ODNS has a profound impact in nanoelectronics, nanodevices and systems, nanocomposite materials, alternative energy resources and national security. The interface of nanoscience and technology with biological and therapeutic sciences is expected to radically improve the ability to provide efficient treatments in otherwise impossible situations. Ironically, the huge investment in the past few years across the globe is yet to bring the real benefit of nanotechnology in day to day life. While scientists and engineers are working towards this goal, concerns about the possible harmful effects of the high aspect ratio materials are increasing every day. Following is an effort to assimilate most of the aforementioned aspects including the entire gamut of ODNS, i.e., elements, ceramics, polymers and composites, with a brief discussion on CNT and toxicology. The focus of this article is mainly on the science behind the synthesis and properties of the ODNS rather than the device fabrication. However, a few challenges in the field of device fabrication are mentioned in appropriate contexts. Possible mechanisms of the ODNS evolution from various methods, such as vapor liquid solid (VLS), template based and electrochemically induced growth, have been discussed in detail. Electron microscopy analysis has received special focus in determining the

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