

PREFACE

Although researchers began to use the prefix “nano” more than thirty years ago, it is only in the last ten years that its use has spread to virtually every field of science, technology and medicine. Today it is used as much for fashion as it is for scientific classification, but the blossoming of interest nevertheless reflects a genuine explosion in the useful application of nanotechniques and nanomaterials to both science and technology. We have reached the point where it is possible to manipulate materials at the molecular and atomic level and create genuinely new materials and processes that are tuned for particular applications. Examples have emerged in fields as disparate as novel semiconductors for nanoelectronics and medicines for the treatment of hereditary illnesses. Capabilities are emerging in nanoscience and nanotechnology that could not have been imagined two decades ago and this book provides an invaluable underpinning for those genuinely interested in understanding their limits and capabilities so that they can apply them to the advancement of science and engineering.

When the prefix “nano” was first used in the 1970s, it genuinely referred to structures with dimensions that approached a nanometer or at least a few nanometers, and distinguished them from microstructures, but as its use spread, the definition was loosened to embrace structures up to 100 nanometer and that is where it has settled. It is important to preserve it at this level if the classification is to remain of value. This volume concentrates on the science and technology that underpins the genuine advances that have been made in manipulation and examination at dimensions below 100 nanometers. Starting with a chapter on carbon and its various molecular configurations it contains chapters written by experts on both man-made and naturally occurring structures, on nanodevices with potential application to information and communication technologies, and on the

advanced analytical and microscopical techniques that have been developed to examine and assess these incredible small artifacts. There are chapters on molecular self-assembly and tunnel transport through proteins showing how science and technology can now operate at a level that probes the internal mechanisms of life itself. The nanoworld is so wide and diverse that no single volume is going to give comprehensive coverage of worldwide activity but this book covers as much as any and will long be useful as a reference to those entering the field or interested in its capabilities.

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