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Sommario/riassunto

Nanotechnology is rapidly growing as a new technology alternative to creating advanced materials with unique characteristics and performance for vast applications in the range of industrial sectors. In recent years, a number of nanotechnology-based products have appeared in our day-to-day life. On the other hand, industries have also considered nano-concepts to produce high-added-value products with superior capacity, reliability, and efficiency. The field of nanotechnology is one of the most popular areas for current research and development in almost all technical disciplines. This includes the miniaturization of microelectronics, nanomedicine, nano-emulsion particles, fuel cell catalysts, self-assembled polymer films, nanofabrication, imprint lithography, and more. This book summarizes recent advances in miniaturization using a nanotechnological approach. The ability to interact with matter at the nanoscale has led to the development of nanoarchitecture and nanomaterials that have the capability of exceeding the limits of conventional modalities. The purpose of this book is to give an insight into the development and trends that are progressing fast in the field of nano-miniaturized-based devices and tools. This book offers an overview of the evolution of the miniaturization of engineering systems and devices that was initiated over one-half century ago. The trend of further miniaturization of devices to the ultimate atomic scale will not only continue, it will become a dominant technological development in the first half of the new century, if not longer. Such development will require significant changes in every aspect of design and manufacture, as well as production management over traditional engineering practices. Production of miniaturized device components and engineering systems of micro- and nanoscale is clearly beyond the capability of current machine tools. Manufacturing of nano-scaled devices and components involves isolation, transportation, and re-assembly of atoms and molecules. This nanomachining technology involves not only physical-chemical processes as in the case of microfabrication, but it also involves application and integration of the principles of molecular biology. .