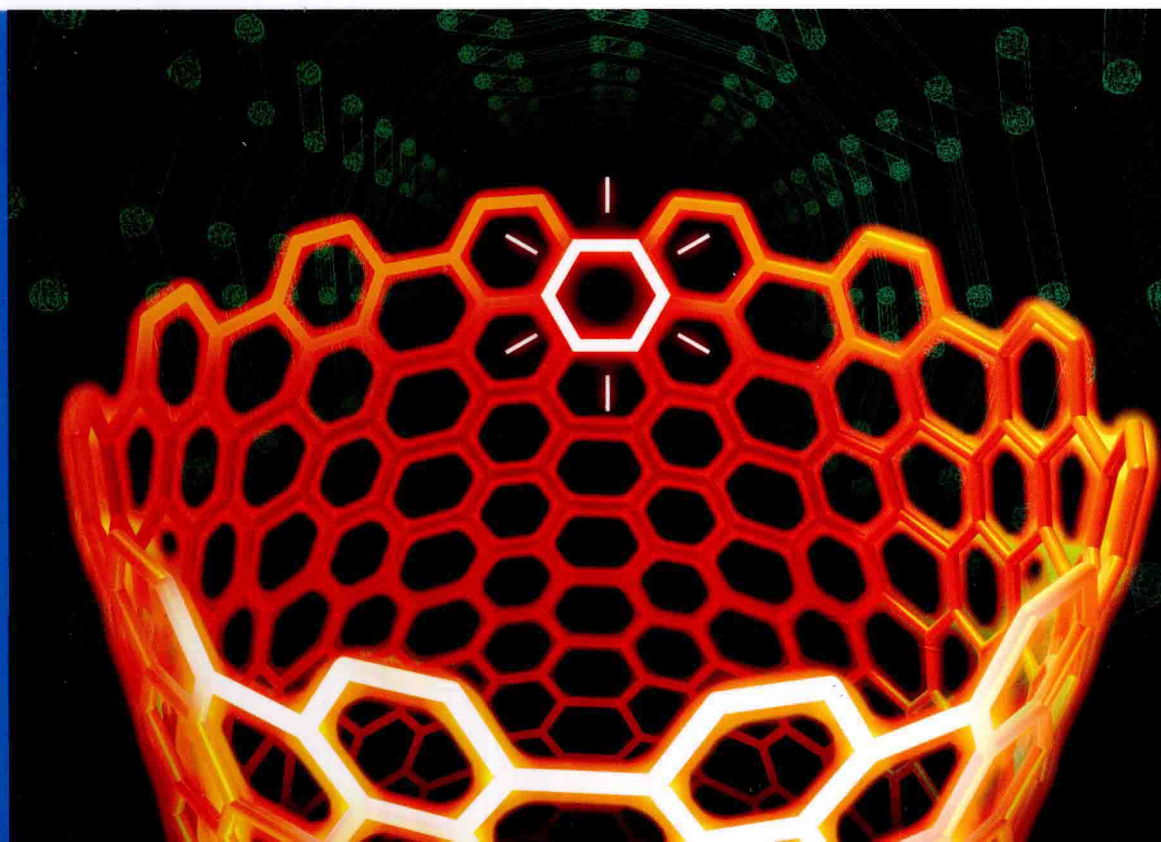


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Carbon Nanotube and Related Field Emitters

Fundamentals and Applications



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Preface

The discovery of carbon nanotubes (CNTs) in 1991 has not only opened a rich field in fundamental science but also given a scope of potential technological applications. CNT is a new class of materials that possess extraordinary properties and propagate nanotechnology and nanoscience. Among the numerous numbers of application proposals of CNTs, the most promising one is a tiny, nanometer-scale field electron emitter that works by applying a low electric voltage in a moderate vacuum. A field emission display (FED) is considered to be the most influential industrial product in which the nanotechnology, CNT, is utilized as a key material, since its commercial market is huge and consumers in general directly experience the technology. At the beginning of the CNT-based FED development, there is an atmosphere that it does not take so much time to realize the products. Through a few R & D projects on CNT-FED, however, it was cognized that it was not so easy to make the high-definition FED with CNT emitters. There are still a number of technical problems to be overcome to put CNT-based FEDs to practical use. Current reduction in retail prices of LCD (liquid crystal display) and PDP (plasma display panel) also makes it difficult to forward the development of FED for TV monitors. But, applications of CNT electron emitters are not limited to TV monitors; character display, digital signage, back light unit, electron sources for various vacuum electronic devices such as miniature X-ray source, and microwave amplifiers. For example, CNT-based character displays are actively developed and are practically used as public signs. Fundamental studies of CNT and related emitters and also continuing development will make CNT electron sources indispensable and core elements in various fields from consumer devices, medical to industry, and space aviation.

This book is the first, comprehensive monograph dealing with CNT and related field emitters covering from the fundamental to the applications. The fundamental part includes structures and preparations of CNTs, electron emission mechanism, characteristics of CNT electron sources, dynamic behaviour of CNTs during operation and so on. Applications of CNT emitters to vacuum electronic devices include displays, electron sources in electron microscopes, X-ray sources, and microwave amplifiers. The book has sought to bring leading researchers in the respective fields to summarize, using tutorial style, the important advances and to suggest promising future research directions. Authors of the chapters are from

different groups worldwide, including academic and industrial circles, guaranteeing a broad view of the topic. I am thankful to the authors who produced excellent chapters that will greatly benefit many readers interested in CNT and related field emitters, and also to John-Wiley for cooperating with us in implementing the book project.

Nagoya, March 2010

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