BOOK REVIEW

Excitonic and Vibrational Dynamics in Nanotechnology: Quantum Dots vs. Nanotubes

Svetlana V. Kilina and Bradley F. Habenicht, 200 pages, ISBN 978-981-4241-30-4, Pan Stanford, Singapore (2009), US$129, hardcover.

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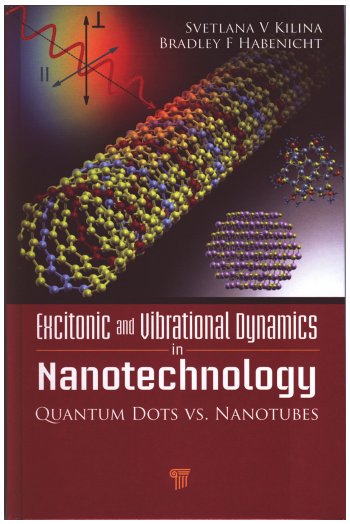

This book contains a thorough theoretical study of quantum dots and single-walled carbon nanotubes using quantum-chemical calculations with the objective of describing excited-state phenomena. The results presented throughout the book provide information about atomic-level mechanisms, although the results are hard to probe experimentally as the authors claim. Given the overall level, the book is aimed at specialists in the field interested in the theoretical aspects of quantum dots and carbon nanotubes.

Regarding the presentation of the book, the letter size is appropriate for reading and the figures are quite coherent, i.e., they have been prepared by the authors following the same style. Color versions of 18 figures are re-reproduced at the end of the book in a section entitled "Color Index". Although color figures generally help in visualizing the different nanostructures and the results, it is uncomfortable to turn to the end of the book to see the figures.

This well-documented book includes a large number of references totaling 23 pages. The list of references includes both papers on theoretical aspects of quantum dots and carbon nanotubes, as well as papers dealing with fabrication and characterization of those nanostructures.

The book comprises six chapters which are self-contained and thus can be independently read. The introduction perfectly serves its objective by providing a context to the reader. It is noteworthy that the authors give an ample definition for quantum dots, including in this category those with a spherical shape, nanorods and even rectangular ones.

The core of the book is formed by three key chapters (numbered 2, 3 and 4), one devoted to quantum dots and two to carbon nanotubes. These three chapters utilize the same structure used in writing scientific papers. First, several experimental results are discussed to motivate the study that follows, then the theoretical model is presented and analyzed in detail, and finally the results are given and discussed. Each chapter ends with a section providing conclusions.

Although Chapter 2, "Electronic Structure and Phonon-Induced Carrier Relaxation in CdSe and PbSe Quantum Dots," presents some general theoretical considerations of electronic and optical properties of quantum dots at the beginning, most of the chapter is exclusively devoted to quantum dots made of CdSe and PbSe. In fact, the results that the authors present are particularized for CdSe and PbSe.

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Chapter 3, “Phonon-Induced Free Carrier Dynamics in Carbon Nanotubes,” and Chapter 4, “Including Electron-hole Correlations: Excitonic and Vibrational Properties of Carbon Nanotubes,” are exclusively devoted to single-walled carbon nanotubes. These two chapters are written in a comprehensive manner.

The last chapter (Chapter 5, “Carbon Nanotube Technological Implementations”) is a short one (just five pages), presenting some of the current and most promising applications of carbon nanotubes. Again, this chapter contains very appropriate references for the reader interested in expanding his/her knowledge regarding the actual and/or potential uses of carbon nanotubes. In my opinion, some of the current and future applications of quantum dots should have been added to this chapter.

Also, an additional chapter summarizing the most significant conclusions extracted from the previous chapters would have been useful.

In summary, the book presents a very interesting analysis of quantum dots and carbon nanotubes based on quantum-chemical calculations. This is not at all an introductory text. Itis targeted at the specialist, and polarized towards the theoretical aspects of these nanostructures. Although the theoretical basis could be used for various nanostructures, the results here presented are particularized for CdSe and PbSe quantum dots, and single-walled carbon nanotubes.

Finally, given the limited scope of the book, the potential number of readers is small. For that reason the book seems overpriced.