

Electrons in Molecules

The scope of this book is very ambitious, as it aims to build a bridge from the fundamental principles of quantum mechanics underlying molecular structure and functionality to the application of molecular properties in nanoelectronics. Its five chapters cover the very basics of electrons and bonding in molecules, their magnetic, electric, and photo-physical properties, and a concise overview of current research directions for the implementation of devices in molecular electronics.

What makes the book unique in the field of molecular electronics is that it provides a clear path from the basic scientific principles to the main ideas for technological applications. This has its merits, but also its limitations. Although the concentration on concepts, using as little mathematics as possible, makes the book accessible for readers who are not theoreticians but want to get a “bird’s-eye-view” understanding of the theoretical framework, the book is far from self-contained, since its chapters can only be seen as short introductions to their topics, pointing the reader towards the more specialized literature.

An undeniable strength of this book is its interdisciplinary perspective, which reflects the nature of molecular electronics, where chemistry, physics, materials science, and electrical engineering overlap naturally. This makes it an important tool for the researcher who comes from one of these disciplines and wants to get an overview of the scientific world in which his/her collaborators live.

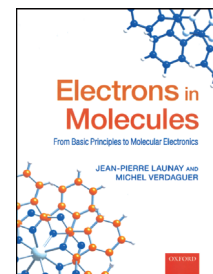
The book’s clear structure in terms of chapters and sub-chapters, and the numerous keywords of the index at its end, facilitate its use also as a handbook, enabling the reader to get a quick grasp of the main characteristics of a particular phenomenon. The wealth of literature references, which is unusually large for a textbook, allows the reader to explore each subject in more depth.

As is unavoidable for any book about molecular electronics, the weight given to specific topics is slightly biased according to the research interests of the authors. For example, Chapter 3 on the electrical properties of molecules is mainly focused on the Marcus theory of thermally induced hopping, whereas Landauer’s theory of coherent electron tunneling is only discussed rather briefly in Chapter 5 on molecular electronics. However, this is not a weakness of the book but a natural consequence of its wide scope. Overall, the research of the authors is not over-emphasized, and the selection of topics follows a clear didactic strategy.

In summary, this book is highly valuable for undergraduate and post-graduate students of chemistry, physics, materials science, and electrical engineering who want to get an initial but comprehensive overview of the most important aspects of molecular electronics. It is less suitable for the more specialized reader who, as the authors concede, might be better off with a recent review focusing on a specific part of the book’s wide scope.

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