



Quantum Confined Laser Devices. Optical Gain and Recombination in Semiconductors. By Peter Blood. Oxford University Press, 2015. Pp. 432. Price GBP 28.99. ISBN 9780199644520

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The author of this book, Peter Blood, is one of the leading experts in the field of the physics of semiconductor lasers, a field in which he has worked and which he has formed for more than four decades. He pioneered the characterization of semiconductor materials, structures and devices. Key parameters addressed by his work are absorption, gain, recombination, threshold currents of diode lasers and defects in semiconductors. Practical approaches, such as analysis of laser gain media by the segmented contact method or edge photovoltage spectroscopy, will always be connected with the name of Peter Blood. When research on quantum-dot devices started, he began working on this topic, and his work counts among the first and best. This book is evidently written by an exceptional scientist with exceptional knowledge, a fact which is clearly visible to any reader.

The author resisted the temptation to write a general (text)book but focused instead on the topic in which he is probably the world-leading expert. As a result, this book does not follow the structure of conventional textbooks on light-matter interaction but is rather midway between a textbook and a high-level review. It is fully focused on what is promised in the subtitle: *Optical gain and recombination in semiconductors*. In part I, the topic of gain is addressed, while part II gives a systematic textbook-like introduction. The other three parts are devoted to devices and device-related analytical work on advanced levels. This book truly has a unique structure. Therefore, some topics are necessarily introduced more than once, on very different levels of abstraction. As a result, the book contains many ‘similar’ sketches of band structures, absorption–gain spectra and light–current characteristics. This is not a drawback. On the contrary, it allows one to approach a certain topic on different levels, fitting the background of a varied audience. Many topics are explained in a way that has never been done before in any other publication. In ch. 9, for example, the behavior of different types of quantum dot ensemble(s) in diode lasers is covered systematically, starting from a single dot, continued by an ensemble of identical dots, followed by an inhomogeneous dot distribution, and finalizing with a dot distribution in a laser waveguide. Another very instructive element of the book is part V, which describes experimental (analytical) approaches for the characterization of diode lasers/laser materials. To the best of my knowledge, this is the first book of this kind in the research field. This holds for the appendices as well, where approaches are introduced and explained in a clear way that one cannot find in any other text. This includes the methodology of gain measurements, spontaneous emission analysis from windowed devices, the segmented contact method and other practical approaches. This information alone would make the book extremely valuable in the field of research.

The outer design of the book and its layout are reader friendly and attractive. The presence of outlines, schemes and references at the page margins facilitates reading and orientation in the text. The concluding remarks and chapter summaries are very helpful. There are almost no defects, but a couple deserve to be pointed out. The statement on page 23 that II–VI semiconductors have been used for practical infrared-emitting devices does not fully apply. Actually, IV–VI diode lasers were used in this niche application for a period of ~20 years, before being (almost) replaced by quantum-cascade devices. The latter do not appear in the book. Since there is no other book dealing with quantum-cascade devices on the same high level(s) as done here for bipolar lasers, it is regrettable



that they have not been included in this book. The same holds for wide-bandgap nitride lasers. But after all, it was probably a wise choice to restrict the presentation to those areas where the author was and is working very actively and successfully

All in all, this is an extraordinary book, which sets new standards. Everybody who deals with diode lasers on a level beyond pure applications should own this book, which I firmly recommend.