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Quantum Dots

Applications in Biology

Third Edition

Edited by

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Cover illustration: Image of human mammary fibroadenoma tissue labeled with CdTe quantum dots conjugated to Cramoll lectin. Quantum dot labeling is depicted in orange.

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Preface

Light plays an important role in life comprehension, allowing for extracting important biological information from single molecules to whole organisms. Among the light-based tools, quantum dots (QDs) have arisen as versatile fluorescent nanoprobe due to their unique optical properties. QDs are highly efficient photostable multifunctional platforms with chemically active surfaces enabling conjugation with molecules, other nanostructures, and surfaces and being an interesting tool to follow long-term biological processes.

When first reported in literature, this class of nanomaterials was not expected to be so useful for biological purposes. Nevertheless, since the end of the 1990s, QDs have been increasingly applied as fluorescent probes in life sciences for quantitative and qualitative labeling of cells, tissues, and small animals, literally shedding light, and unraveling many biological processes. Additionally, over these years, studies in bioanalytical and biosensing fields, which exploit both optical and semiconductor properties of QDs, have also aroused remarkable interest. Moreover, novel conjugation procedures and methods for evaluating these processes have been proposed. More recently, the blinking property of QDs began to be explored in super-resolution microscopy.

In this context, approximately 5 years from the second edition, the third edition of the book *Quantum Dots: Applications in Biology* brings 19 chapters addressing consolidated approaches as well as new trends in the field. The book is organized in four parts; the first part comprises two tutorials, one describing a multivariate approach to optimize the desired QD property and another evaluating the quantum yield of QDs. The second part covers some important features about preparative processes and characterizations of QDs for their successful use as fluorophores. The third part presents methods related to QDs for live cell applications. Finally, the last part demonstrates the versatility of QDs in the bioanalytical and biosensing field. The editors hope that the book can be a useful reference material for people who already work with QDs, providing information about methods and protocols from the basics to the applied science.

Recife, Pernambuco, Brazil

*Adriana Fontes
Beate S. Santos*

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