

Preface

The various scientific fields, depending upon worth and applications, have earned due attention and contributed toward human development and technological progress. In this context, the science of materials has undoubtedly played a vital role in the realization of current technological status of mankind. The recent scientific progress has increased the awareness as well as the demands and expectations of the society which has raised the obligations of the researchers to meet the future necessities. The leading fraction of the community believes that the renaissance of science has taken place in the form of nanotechnology which is considered as a proud intervention of current generation of scientists. The material researchers and scientists are supposed not only to replicate every known material into its nanoscale counterpart but also to prepare new materials to meet the future technological requirements.

In my view, the evolution of any new science discipline involves four stages: discovery of relevant phenomenon, establishing the theoretical/conceptual background, developing a research methodology, and finally utilization of the attained knowledge for applications or improvement in basic understanding of the relevant fields. Unlike majority of the scientific areas, despite extensive activities, the research related to nanotechnology is simultaneously continued at fronts related to last three stages which points to an inefficient and unidirectional progress in the field. Besides several other issues, the problems related to reproducibility, quality control, yield, aging, and availability of reliable characterization tools for nanomaterials need to be addressed without any further delay. In order to accomplish the logical and desired climax in the field of nanotechnology, the community should exclusively work on producing consensus in production and processing of nanomaterials to make them usable in device grade applications. A worldwide narrative and globally accepted protocol on nanotechnology need to be established. For this purpose, a widespread overview of the global research activities and a dialogue is needed to revisit the preparation strategies, material's handling and processing, characterization techniques, and potential of the materials for commercial grade devices. The current book is aimed at providing an exhaustive analysis of the research activities carried out to prepare cadmium chalcogenides II-VI

semiconducting nanomaterials. The synthesis of CdS, CdTe, CdSe, and CdO using more than 25 experimental techniques carried out over the years and reported in the scientific literature has been described in this book to provide a comprehensive review for analysts, critics, researchers, and general readers.

The compound semiconductors especially II-VI semiconductors are potential candidates for a variety of technological applications in addition to their conventional use in electronic, electro-optic, and piezoelectric devices. At present, these materials have fascinated the investigators for their remarkable properties which are due to three-dimensional confinement of carriers and rise in the number of surface atoms. These semiconductors, when downsized to nanometer, have become the center of attention because of their tunable band structure, high extinction coefficient, possible multiple exciton generation, electronic and transport properties. These materials are extremely valuable to cover the extensive range of expositions in optoelectronic devices, solar energy conversions, etc. Out of II-VI family, cadmium-based semiconductors are prominent members due to their excellent physical, chemical, and device grade properties. A lot of work related to these materials in bulk has been done, reported, and reviewed at almost every possible forum. However, in case of nanoscale counterpart of these materials, although significant work has appeared in the form of research articles, review papers, and internet sources, a comprehensive source in the form of book is not available so far. This book is aimed at providing comprehensive information on synthesis of cadmium-based semiconducting nanomaterials in one source with wide target readership comprising of students, researchers, scientists, technicians, academicians, industrialists, etc. The write-up was planned to provide one-stop-solution on research activities in the field. A section of Chap. 2 is dedicated to provide guidelines to junior researchers and students to interpret the experimental results, obtained from traditional characterization tools, on nanomaterials. The rest of the chapters of the book provide an all-inclusive and updated overview of the global research efforts made by researchers and scientists to produce nanomaterials of cadmium chalcogenide semiconductors by using nearly every reported synthesis technique. It is hoped that the readers having different expertise, disciplines, backgrounds, and knowledge will find stuff of their interest. Moreover, this book will not only be helpful for people working in the field of chalcogenide nanomaterials but also in exploring the synthesis strategies for other metallic and insulating/semiconducting compound materials. The researchers, technicians, and industrialists related to coating technology will be highly benefited from this document. I am confident to say that, the current book has significant material of interest for beginners, experts, technologists, and policy makers related to the fields of nanoscience and nanotechnology.

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Synthesis Routes and Strategies

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