

NANO-SEMICONDUCTORS AND AI IN MATERIAL SCIENCE AND MEDICAL TECHNOLOGIES

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PREFACE

It gives me immense pleasure to present this edited volume, *Nano-Semiconductors and AI in Material Science and Medical Technologies*, which brings together emerging research, innovative concepts, and interdisciplinary perspectives at the interface of nanoscience, semiconductor technology, artificial intelligence, materials science, and healthcare.

The rapid advancement of nanotechnology and artificial intelligence is transforming the way materials are designed, characterised, optimised, and applied in real-world technologies. Nano-semiconductors, with their unique electrical, optical, structural, catalytic, and biomedical properties, have emerged as key materials for next-generation applications. At the same time, Artificial Intelligence and Machine Learning are providing powerful tools for predicting material properties, accelerating material discovery, optimising synthesis processes, analysing complex data, and developing intelligent healthcare technologies.

This book comprises **20 chapters** contributed by research scholars, faculty members, and students who are actively engaged in diverse areas of scientific and technological research. The chapters reflect the multidisciplinary nature of contemporary research and cover important topics related to nano-semiconductors, nanomaterials, thin films, artificial intelligence, machine learning, material characterisation, biomedical applications, healthcare technologies, sensors, energy-related applications, and emerging innovations.

A special strength of this volume is the participation of researchers at different stages of their academic and professional careers. The contributions of research scholars, faculty members, and students demonstrate the importance of collaborative knowledge creation and provide a platform for sharing new ideas, research findings, methodologies, and technological perspectives. The chapters also highlight the growing importance of interdisciplinary approaches in addressing complex scientific and societal challenges.

The integration of AI with nanomaterials and semiconductor technologies is expected to play a significant role in the future of smart materials, precision healthcare, medical diagnostics, biomedical devices, sustainable energy systems, environmental monitoring, and advanced technological applications. This volume therefore aims not only to present current research perspectives but also to encourage further exploration and innovation in these rapidly developing fields.

I sincerely acknowledge and appreciate the valuable contributions of all the authors who have shared their knowledge, research findings, and expertise in this volume. I also express my gratitude to the reviewers, academic colleagues, research scholars, students, and everyone who supported the preparation of this book. Their commitment and cooperation have contributed significantly to the completion of this scholarly work.

I hope that *Nano-Semiconductors and AI in Material Science and Medical Technologies* will serve as a valuable reference for researchers, academicians, postgraduate students, research scholars, students, and professionals working in nanotechnology, material science, semiconductor technology, artificial intelligence, biomedical engineering, medical technologies, and related interdisciplinary fields.

It is my sincere hope that this book will stimulate new ideas, promote interdisciplinary collaboration, and inspire future research and innovation at the convergence of nanoscience, artificial intelligence, materials science, and medical technologies.

ACKNOWLEDGEMENT

I express my profound gratitude to the **Almighty God** for granting me the strength, wisdom, and perseverance to complete this edited volume, **Nano-Semiconductors and AI in Material Science and Medical Technologies**.

I sincerely express my heartfelt gratitude to **Er.G.Rajasekaran, Secretary, Indra Ganesan Institutions, Trichy**, for his constant encouragement, valuable support, and continued motivation towards academic excellence, research, and innovation. I also extend my sincere thanks to **Dr G. Balakrishnan, Director, Indra Ganesan Institutions, Trichy**, for his valuable guidance, encouragement, and support in promoting research and scholarly activities.

I would like to express my sincere appreciation to the **Department of Research and Development team members, Indra Ganesan Institutions**, who have been integral to our research journey. Their constant encouragement, valuable discussions, cooperation, and support have contributed significantly to my academic and research pursuits. I sincerely acknowledge their companionship throughout the research journey.

My sincere thanks and appreciation go to all the **contributing authors of the twenty chapters**, including research scholars, faculty members, and students from various institutions across **India and abroad**. I deeply appreciate their valuable contributions, commitment, cooperation, and willingness to share their research findings and expertise. The successful completion of this book would not have been possible without their enthusiastic participation and scholarly contributions.

I also express my heartfelt gratitude to my **family members** for their unconditional love, patience, understanding, encouragement, and continuous support. Their constant presence and encouragement have been a source of strength and inspiration throughout my academic and research journey.

Finally, I extend my sincere thanks to everyone who has directly or indirectly contributed to the successful completion of this book. I am deeply grateful to all those who have supported, encouraged, and inspired me in this scholarly endeavour.

Dr. M. Anusuya

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