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Analytical Techniques for Biomedical Nanotechnology

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Analytical Techniques for Biomedical Nanotechnology

Edited by

Ajeet Kaushik

*NanoBioTech Laboratory, Department of Environmental Engineering, Florida
Polytechnic University, Lakeland, FL 33805, USA*

Sesha S Srinivasan

*Department of Engineering Physics, Florida Polytechnic University, Lakeland,
FL 33805, USA*

Yogendra Kumar Mishra

*Mads Clausen Institute, NanoSYD, University of Southern Denmark, Alison 2,
6400 Sønderborg, Denmark*

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The authors dedicate this book to every analytical technology making the science of spatial impact by providing information and knowledge to understand the existing state-of-the-art technology and explore future technology for a sustainable society.

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Preface

This book is an effort to explore ‘analytical techniques’, at both, the fundamental as well as the applied level, for biomedical applications. It aims to provide a broad perspective about the development of analytical methods involved in materials science and electronics, especially in the field of nano-enabled biomedical sciences. It will highlight the fundamentals and systematic developments in analytical techniques to achieve better characterization, providing more scientific information, rapid diagnostics, cost-effective, user-friendly approaches, and most importantly the *state-of-art* developing methodologies for personalized health management. Moreover, it will give an adequate understanding of the imposed limitations and propose the future perspectives and challenges associated with analytical methods to achieve the desired performance in targeted biomedical applications.

Recently, nanotechnology has emerged as a necessary vehicle for the development of advanced technologies for healthcare and wellness. Such developments require advanced surface functionalized hybrid materials for targeted biomedical applications. Nano-biotechnology assisted methodologies are gaining attention due to desired performance, which can be useful to detect, monitor, and manage targeted diseases. Moreover, the significant advancements in developing ‘holy grail’ materials for biomedical applications often demand the availability of advanced analytical techniques, which are the key factors to understanding the followings aspects.

1. To identify the fundamental knowledge of the various analytical techniques and procedures with reference to targeted biomedical applications.
2. To explore alteration in properties of materials, bio-systems, and involved interfaces in the nano–bio-systems.
3. To demonstrate whether the as-developed nano-system and devices are useful for health and wellness or otherwise need more developments.
4. To develop the miniaturized, reliable, and efficient systems of high sensitivity and selectivity needed for complex disease managements.
5. To discover the knowledge of the nano–bio interface to assess the potential of techniques and the corresponding developed prototypes.

As objectives, it has been noted that on-going nano-biotechnology related research involves multidisciplinary science and simultaneous expertize from various fields on a single platform. The role of analytical science has improved the performance of devices, which have been developed for biomedical applications. Despite significant advances, there is a gap between chemists, biologists, physicists, mathematicians, engineers, and information technologists (internet of things) and bridging that gap is essential for adequate realizations of advanced biomedical technological breakthroughs. To develop the next generation technologies, this book

is crucial to bridge the gap and connect experts. The major objectives of this book will be:

- (a) to investigate the analytical techniques for targeted biomedical applications,
- (b) to introduce the fundamental insights and mechanisms for conceptual understanding,
- (c) to identify the prospects and perspectives of analytical tools and techniques,
- (d) to demonstrate the challenges and involve experts of different disciplines to develop innovative and precise measurement systems, and
- (e) to explore the multidisciplinary research for developing advanced systems for improved performance with respect to targeted nanomaterials-based biomedical applications.

This book will educate the scholars (students, researchers, post-docs, scientists, academicians, industrialists, government) and experts who belong to different disciplines and conducting multidisciplinary research. The knowledge of this book will be useful to translate fundamental research to applied nano-enabled biomedical research. In addition to fundamental knowledge at deep levels, this book will be an ideal platform to explore appropriate single or combinational techniques to improve the system's performance as per requirements, i.e., point-of-care health wellness.

Ajeet Kaushik
Sesha S Srinivasan
Yogendra K Mishra

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Editor biographies

Ajeet Kaushik



Ajeet Kaushik is an assistant professor of Chemistry at the Department of Environmental Engineering of Florida Polytechnic University. He has over 15 years of experience in exploring analytical techniques for the characterisation of nanostructures, bio/chemical sensors fabrication confirmation, and nanomedicine optimization. Prior to joining Florida Polytechnic University in 2019, he worked as a faculty member at the Medical College of Florida International University.

Sesha S Srinivasan



Sesha Srinivasan is an assistant professor of Engineering Physics at Florida Polytechnic University. He has more than two decades of research and project management experience with expertise in the analytical characterization and synthesis of novel materials for emerging applications in hydrogen storage, catalysis, thermochemical and thermal energy, thermochromic coatings, advanced oxidation and biofuel generation. Srinivasan was a Postdoc (2002–2004) at the University of Hawaii, Research Assistant Professor (2004–2009) at the University of South Florida, and on the Faculty of Physics (2009–2014) at Tuskegee University.

Yogendra K Mishra



Yogendra Mishra is a professor and leader of Smart Materials at University of Southern Denmark. He was an Alexander von Humboldt Fellow and later a Group Leader at Kiel University, Germany, from 2009 to 2019. He joined University of Southern Denmark as a professor in 2019. He is known world-wide for tetrapod-based 3D materials engineering and translational materials-based research activities.

List of contributors

Tansir Ahamad

Department of Chemistry, College of Science, King Saud University, PO Box 2455, Riyadh 11451, Saudi Arabia

Md. Mottahir Alam

Department of Electrical and Computer Engineering, Faculty of Engineering, King Abdulaziz University, PO Box 80204, Jeddah 21589, Saudi Arabia

Radheka Bhaduri

St. Xaviers College, Kolkata (Autonomous), West Bengal, India

Shilpa Bhatkande

Arts and Science Department, University of Houston-Victoria Katy Campus, 22400 Grand Cir Blvd Suite 206, Katy, TX 77449, USA

Rahul Bhattacharjee

KIIT School of Biotechnology, Kalinga Institute of Industrial Technology (KIIT-DU), Bhubaneswar, Odisha, India

Hima Sree Buddhiraju

Department of Biomedical Engineering, Indian Institute of Technology Hyderabad, Kandi 502 284, India

Srija Chakrabarty

St. Xaviers College, Kolkata (Autonomous), West Bengal, India

Soumalya Chakraborty

Department of Pharmaceutics, National Institute of Pharmaceutical Education and Research (NIPER), Sector 67, S.A.S. Nagar, Mohali 160062, Punjab, India

Sanjoy Kumar Das

Institute of Pharmacy, Jalpaiguri, West Bengal 735101, India

Abhijit Dey

Department of Life Sciences Presidency University 86/1 College Street, Kolkata 700073, West Bengal, India

Swapnil Dharaskar

Nano-Research Group, Department of Chemical Engineering, School of Technology, Pandit Deendayal Energy University, Raisan, Gandhinagar, Gujarat 382426, India

Jaspreet Dhau

Research and Development, Molekule Inc, 3802 Spectrum BLVD, Tampa, FL 33612, USA

Neeraj Dilbaghi

Department of Bio and Nano Technology, Guru Jambheshwar University of Science and Technology, Hisar-Haryana 125001, India

Shraddha Dorlikar

Department of Microbiology, Rashtrasant Tukadoji Maharaj Nagpur University, India

Hardik Gohel

Arts and Science Department, University of Houston-Victoria Katy Campus, 22400 Grand Cir Blvd Suite 206, Katy, TX 77449, USA

Akhilesh Kumar Gupta

Department of Physics, University of Nebraska Omaha, NE 68182, USA

Gaurav Hitkaric

School of Applied Sciences, Shri Venkateshwara University, Rajabpur Gajraula Amroha 244236, India

Mohd Imran

Department of Chemical Engineering, Faculty of Engineering, Jazan University, PO Box 706, Jazan 45142, Saudi Arabia

Sulagna Kar

KIIT School of Biotechnology, Kalinga Institute of Industrial Technology (KIIT-DU), Bhubaneswar, Odisha, India

Sandeep Kaushik

Department of Environmental Science, Indira Gandhi National Tribal University, Amarkantak, MP 484887, India

Afzal Khan

State Key Laboratory of Silicon Materials, School of Materials Science and Engineering, Zhejiang University, Hangzhou 310027, China

Kamil Reza Khondakar

School of Health Sciences and Technology, University of Petroleum and Energy Studies, Dehradun 248007, Uttarakhand, India

N Y Kim

RFIC Center, Kwangwoon University, Seoul 139-701, Republic of Korea

Rajeev Kumar

Department of Environment Studies, Panjab University, Chandigarh 160014, India

Sandeep Kumar

Department of Bio and Nano Technology, Guru Jambheshwar University of Science and Technology, Hisar-Haryana 125001, India

Saurabh Kumar

Centre for Nano Science and Engineering (CeNSE), Indian Institute of Science, Bengaluru, India

Department of Medical Devices, National Institute of Pharmaceutical Education and Research, Guwahati, India

Vijay Kumar

Department of Physics, National Institute of Technology Srinagar, Jammu and Kashmir 190006, India

Chinmaya Mahapatra

Department of Biotechnology, National Institute of Technology Raipur, Raipur, Chhattisgarh 492010, India

Vidhu Malik

Department of Chemistry, DCRUST Murthal, Sonapat, Haryana, India

Priyanka Mankotia

Institute of Forensic Science & Criminology, Panjab University, Chandigarh 160014, India

Hirak Mazumdar

Woxsen University, Hyderabad 502345, India

Bhaskar Mazumder

Department of Pharmaceutical Sciences, Dibrugarh University, Dibrugarh 786004, Assam, India

Jyotsana Mehta

Department of Bio and Nano Technology, Guru Jambheshwar University of Science and Technology, Hisar-Haryana 125001, India

Priya Mitra

KIIT School of Biotechnology, Kalinga Institute of Industrial Technology (KIIT-DU), Bhubaneswar, Odisha, India

Sayan Mukherjee

School of Medical Sciences and Technology, Indian Institute of Technology, Kharagpur, India

Vivek Kumar Nautiyal

Department of Physics, Gaya College Gaya, a constituent unit of Magadh University, BodhGaya, Bihar 823001, India

Vanya Nayak

Department of Chemistry, Banaras Hindu University, Varanasi, Uttar Pradesh 221005, India

Karishma Niveria

Nanobiotech Lab, Department of Zoology, Kirori Mal College, University of Delhi, Delhi 110007, India

Ritesh Palkar

Department of Chemical Engineering, Faculty of Technology, Marwadi University, Rajkot, Gujarat 360003, India

Shashank S Pawitwar

Department of Cellular Biology and Pharmacology, Herbert-Wertheim College of Medicine, Florida International University, Miami, FL, USA

G Qiao

School of Materials Science and Engineering, Jiangsu University, Zhenjiang 212013, China

Rajan Rajabalaya

PAPRSB Institute of Health Sciences, University Brunei Darussalam, Brunei Darussalam

Pooja Rawat

Department of Applied Physics and Institute of Natural Sciences, Kyung Hee University, Yong-in 17104, Republic of Korea

Syed S Razia

Department of Chemistry, Gaya College Gaya, a constituent unit of Magadh University, BodhGaya, Bihar 823001, India

Aravind Kumar Rengan

Department of Biomedical Engineering, Indian Institute of Technology Hyderabad, Kandi 502 284, India

Jong Soo Rhyee

Department of Applied Physics and Institute of Natural Sciences, Kyung Hee University, Yong-in 17104, Republic of Korea

Nitish Sagar

Centre for Nano Science and Engineering (CeNSE), Indian Institute of Science, Bengaluru, India

Ishwar Prasad Sahu

Department of Physics, Indira Gandhi National Tribal University, Amarkantak, MP 484887, India

K Saremi

Institute of Biological Science, Faculty of Science, University of Malaya, 50603 Kuala Lumpur, Malaysia

S V Satya Prasad

Department of Production and Industrial Engineering, National Institute of Technology Jamshedpur, Jharkhand 831014, India

Rakesh Sehgal

Department of Mechanical Engineering, National Institute of Technology Srinagar, Jammu and Kashmir 190006, India

Prosenjit Sen

Centre for Nano Science and Engineering (CeNSE), Indian Institute of Science, Bengaluru, India

Z Shahnava

School of Materials Science and Engineering, Jiangsu University, Zhenjiang 212013, China

Kashma Sharma

Institute of Forensic Science & Criminology, Panjab University, Chandigarh 160014, India

Parshant Kumar Sharma

RFIC Bio Centre, Kwangwoon University, 20 Kwangwoon-ro, Nowon-gu, Seoul 01897, South Korea

Department of Electronics Engineering, Kwangwoon University, 20 Kwangwoon-ro, Nowon-gu, Seoul 01897, South Korea

Vishal Sharma

Institute of Forensic Science & Criminology, Panjab University, Chandigarh 160014, India

Poonam Shashidhar

TERI-Deakin Nanobiotechnology Centre, The Energy and Resource Institute, Gurugram, Haryana 122001, India

Deakin University, Geelong, Waurm Ponds, VIC, Australia

M J A Shiddiky

School of Environment and Science (ESC) and Queensland Micro- and Nanotechnology Centre (QMNC), Griffith University, Nathan, QLD 4111, Australia

Ravikumar B Shinde

Department of Zoology, Shri Pundlik Maharaj Mahavidyalaya, Nandura, MS, India

Vikas Shukla

Nanobiotech Lab, Department of Zoology, Kirori Mal College, University of Delhi, Delhi 110007, India

S Shweta

Department of Botany, Guru Ghasidas University, Bilasur, Chattisgarh 495009, India

Amritpal Singh

Department of Chemistry, Mata Gujri College, Fatehgarh Sahib 140406, India

Avtar Singh

Research and Development, Molekule Inc, 3802 Spectrum BLVD, Tampa, FL 33612, USA

Department of Chemistry, Sri Guru Teg Bahadur Khalsa College, Anandpur Sahib, Punjab 140118, India

Kirandeep Singh

Physical and Material Chemistry Divison, CSIR-National Chemical Laboratory,
Pune 411008, India

Kshitij RB Singh

Department of Chemistry, Banaras Hindu University, Varanasi, Uttar Pradesh
221005, India

Poonam Singh

Department of Applied Chemistry, Delhi Technological University, Delhi, India

Ravindra Pratap Singh

Department of Biotechnology, Indira Gandhi National Tribal University,
Amarkantak, MP 484887, India

Subhash Singh

Department of Production and Industrial Engineering, National Institute of
Technology Jamshedpur, Jharkhand 831014, India

Anindita Tarafdar

Department of Biomedical Engineering, Indian Institute of Technology
Hyderabad, Kandi, 502 284 India

Yash Thakare

Department of Chemical Engineering, Sinhgad College of Engineering, Pune,
Maharashtra, India

Anita Kamra Verma

Nanobiotech Lab, Department of Zoology, Kirori Mal College, University of
Delhi, Delhi 110007, India

Kartikey Verma

Department of Chemical Engineering, Indian Institute of Technology Kanpur,
Kanpur 208016, Uttar Pradesh, India