Preface

Nanoscience and nanotechnology are the study and application of extremely small things or materials with typical dimension spans from subnanometer to several hundred nanometer and can be used across all the other science fields, such as chemistry, biology, physics, materials science, and engineering. Nanotechnology is not just a new field of science and engineering, but a new way of understanding the behaviour materials at nanoscale. Nanoscience and nanotechnology involve the ability to see and to control individual atoms and molecules. Everything on Earth is made up of atoms—the food we eat, the clothes we wear, the buildings and houses we live in, and our own bodies. Nanotechnology is serving to improve for the revolution in many technologies and industry sectors such as information technology, energy, environmental science, medicine, food safety, and transportation, among many others. Most benefits of nanotechnology depend on the fact that it is possible to tailor the essential structures of materials at the nanoscale to achieve specific properties, thus greatly extending the well-used toolkits of materials science. Using nanotechnology, materials can effectively be made to be stronger, lighter, more durable, more reactive, more sieve-like, or better electrical conductors, among many other traits. There already exist over 800 everyday commercial products that rely on nanoscale materials and processes.

Till today, the nanoscience and nanotechnology was primarily concerned with electronics, manufacturing, supercomputers, and data storage devices. Recently scientist have broadened the applications of nanotechnology in a number of prominent fields including optoelectronics, biomedical, pharmaceutical, cosmetic agent, sensors, environmental cleanup, energy assisted and catalytic materials. This has increased the interaction between various scientific fields such as electronics, chemistry, physics, biology, material science, medical sciences, and information & communication sciences. All the development in this field is scattered and difficult to get below one umbrella. This has prompted to us to bring all development related to engineering applications of nanoscience and nanotechnology in various specialized fields together in the form of compact data base. This Volume of Materials Science Forum titled “Engineering Applications of Nanoscience and Nanomaterials” reports the latest developments and original applications, and theoretical researches in the area of nanoscience and nanomaterials.

This Special Topic Volume is a result from the contribution of thirty seven experts from the international scientific community in the respective field of research. It thoroughly covers various engineering applications of nanomaterials in various fields such as catalysis, sun protective materials, organic synthesis, sensor, coatings, energy efficient hear transfer, thermoplastics, waste water treatment, electronic component, solid oxide fuel cell, photocatalysis, It gives a

comprehensive picture of the nanoscience and nanomaterials that has posed several scientific and technological challenges in this area. This volume will provide the latest and in-depth coverage to the nanomaterials and their applications.

This volume is indeed the result of remarkable cooperation of many distinguished experts, who came together to contribute their research work and comprehensive, in-depth and up to date review chapters. We are very thankful to all contributing authors who, in spite of their busy life in research and teaching, willingly accepted the call to contribute and sent their manuscript in time. We would also like to express my gratitude to all the publishers and authors and others for granting us the copyright permissions to use their illustrations. Although sincere efforts were made to obtain the copyright permissions from the respective owners to include the citation with the reproduced materials, we would like to offer my honest apologies to any copyright holder if unknowingly, their right is being infringed.

We would like to take this opportunity to express my sincere gratitude and also like to acknowledge the sincere efforts of Mr. Thomas Wohlbier of TTP publishing Authority and his team, in evolving this Special Topic Volume in to its final shape.

Ajay Bansal
Department of Chemical Engineering,
National Institute of Technology,
Jalandhar, 144011, Punjab,
INDIA

Rajesh J. Tayade
Discipline of Inorganic Materials & Catalysis,
Central Salt & Marine Chemicals Research Institute,
Bhavnagar-364002, Gujarat
INDIA