

FOREWORD

What is nano? For an ordinary person, this is something quite small, minuscule, out of our perception... but it seems possible to imagine right now thanks to science-fiction movies. Nevertheless, to comprehend this, it is necessary to talk about nanoscale, which is a way of measuring things whose length is of the order of a few nanometers, being a nanometer a one billionth part of a meter. This is not a different world, it is just our world observed with a different point of view (and some different rules, of course), allowing us to understand how this world is built, and how we can rebuild it -and rebuild us- to improve it. Something similar happened before in 1667 when Leeuwenhoek reported the first detailed description of protists and bacteria living in the previously unknown microcosmos.

For the **Instituto Politécnico Nacional** of Mexico, the **Nanoscience and Micro Nanotechnology Network** (NMN Network) has a relevant role in the study and development of this kind of technology, which is intended to become a major element of our national industry in the next years. The **NMN Network** has as its main objectives to conduct basic and applied research in nanotechnology and nanoscience as well as to promote the training of postgraduate students of the highest level who will join the industry in the very near future.

The book **Research Advances in Nanosciences, Micro and Nanotechnologies Volume IV** compiles the latest scientific works developed by the members of the **NMN network**, covering multiple applications in different branches of science. Like its predecessors, the book's contributions stand out for in the originality and the scientific rigor with which various topics are addressed from the perspective of nanosciences and nanotechnology. Throughout several

chapters, the authors deal with distinct items where nanotechnology can offer new insight into the possible solutions to some unsolved problems like cancer, food quality, and conservation, energy conversion, generation of hydrogen, mechanical improvement of materials, etc.

The book is organized in five great areas: Health; Food; Energy; Environment; and Semiconductors and Materials.

In the first section, referred to as the **Health Area**, four topics are dealt with: the effect of particle size and polydispersity index on the design of the nanostructured lipid carriers for cancer treatment; the design of nanomaterials to improve the mammography images for a breast cancer diagnosis; the thermal study of nanocomposites seeking its application in medical studies; and the numerical simulation of biosensors and microfluidics.

In the second section, addressed to the **Food Area**, the authors develop three topics: for the first one, they studied the influence of the addition of organic compounds in obtaining gelatin nano-fibers; in the second, they analyzed the effects of nano-coatings on tomato quality during storage; the third topic concerns the effectivity of nano-encapsulation of riboflavin in biodegradable polymeric matrices when they use nano-spray drying.

Concerning the **Energy Area**, other members of the NMN Network have focused in four different items: the use of metal nanoparticles for energy conversion based on glycerol electrooxidation; the exploration of water oxidation reaction through the incorporation of iron blocks into laminar hydroxides of iron and nickel; the evaluation of the structural properties of the solid state of fuel cells; and the hydrogen's photocatalytic generation using titanium and bismuth oxides.

The fourth section: **Environment**, is a unique chapter that focuses on studying the influence of the chemical structure of organic compounds in organogel formation for the removal of organic solvents.

Finally, the last section is dedicated to **Semiconductors and Materials**, with two chapters: the first one studies the reliability of flexible amorphous In-Ga-Zn-O (a-IGZO) thin-film transistors, while the second chapter shows an evaluation of the mechanical stability of the superhydrophobic nano-coating for buildings materials application.

I am sure that the contributions of this book, made by polytechnical researchers of the highest level, will be added to the host of solutions that are being developed worldwide to solve some of the major problems that afflict human beings with a different vision, but also to open the way for new investigations into unsuspected nano cosmos that we still do not know, but that has undoubtedly always been there.

We hope you enjoy reading.

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