

Preface

Energy and environment head the list of top global problems facing society in the twenty-first century. Nanotechnology is responding to these challenges by designing and fabricating functional nanofibers optimized for energy and environmental applications. The route towards these nano-objects is based primarily on electrospinning: a highly versatile method that allows the fabrication of continuous fibers with diameters down to a few nanometers. In recent years, breakthroughs in electrospun nanofibers, especially in their applications in the energy and environmental sectors, have opened up the possibility of moving beyond our current options to ensure sustainable energy and preserve our environment for the future.

This book, *Electrospun Nanofibers for Energy and Environmental Applications*, is a collection of 20 chapters contributed by the world's leading experts in the electrospinning field. Each chapter covers a special subject that falls within three general areas: Introduction, energy applications, and environmental applications, corresponding to the three parts of the book.

Part I Introduction first provides a general overview of the electrospinning technique, including the history, basic principles, theoretical background, and controlling parameters. This is followed by a detailed introduction to electrospun nanofibers, involving the materials classes as well as the morphologies and structures of nanofibers. Finally, a brief analysis of nanofibers used for advanced energy and environmental applications indicates their substantial and promising impact.

Part II Electrospun nanofibers for energy applications covers the main developments in the use of nanofibers in energy conservation and storage. Each chapter reports on recent contributions of nanofibers in selected areas of energy, such as fuel cells, electrodes of lithium-ion batteries, separators for lithium-ion batteries, dye-sensitized solar cells, organic and hybrid solar cells, super capacitors, hydrogen storage, thermal storage, and carbon dioxide capture.

Part III Electrospun nanofibers for environmental applications focuses on the potential applications of nanofibers in environmental monitoring and management, which are mainly concerned with the ever-growing issues of water and air pollution. These chapters present how functional nanofibers help to improve the environment

in contexts such as sensors, air and liquid filtration, structurally-colored fibers, fibers with photocatalytic, self-cleaning and adsorbent properties, oil spill clean-up, and electromagnetic shielding, examining them in depth.

This book is intended to provide a balanced treatment of the various topics of electrospun nanofibers in energy and environmental-related areas with both a general overview and detailed discussions to suit a broader audience. We sincerely hope it will pique your interest in electrospun nanofibers and their fascinating applications in energy and environmental related areas.

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