

Preface

We are pleased to present this remarkable book, a collaborative effort of esteemed experts from around the globe who have come together to share their groundbreaking research and insights. This book offers a comprehensive exploration of diverse topics that span multiple disciplines and industries.

The chapters in this compilation represent an extraordinary collection of applied research, each contributing valuable knowledge and innovative approaches to their respective fields. With a strong emphasis on relevance to industry, the authors have sought to address practical challenges and provide solutions that can drive positive change.

The book commences with an introductory chapter on polymers science and technology. The next chapter provides an in-depth examination of the influence of electrolytic-plasma treatment on the tribological properties of high-speed steel. This chapter sheds light on the impact of surface engineering techniques on high-speed steel and explores the high-temperature testing of nitrided layers. Their findings offer crucial insights into enhancing the performance and durability of materials.

Continuing the exploration of surface treatments, the third chapter focuses on changes in the structural-phase state of ferrite-perlite steel through electrolyte-plasma surface quenching. This chapter provides a comprehensive analysis of the effects of surface quenching on steel grade 2, opening new avenues for improving material properties.

The book further delves into the realm of coatings and their impact on materials. The fourth chapter explores the deposition of hard and superhard multicomponent nitride coatings using vacuum-arc evaporation. This research sheds light on the structure and properties of nanostructured coatings, providing valuable insights into materials fabrication.

The fifth and sixth chapters discuss surface hardening on wheel steel using electrolytic plasma to the electrolytic plasma treatment of Turkurite-phase in high-speed steels. These chapters delve into the transformative potential of advanced surface treatments and offer insights into fine structure formation and phase composition in various materials.

Another captivating chapter explores the detonation-gun spraying technology for multilayer coatings. The research described in this chapter seven unravels the potential of this method in obtaining multilayer coatings, offering new possibilities for advanced materials fabrication.

Additionally, the book addresses the pressing issue of industrial wastewater treatment through the eighth and ninth chapters on the photocatalytic treatment using semiconductor-based materials and nanotechnological approaches for water and wastewater treatment. These chapters highlight the potential of innovative technologies in mitigating environmental challenges.

The role of two-dimensional nanomaterials in electrodes for rechargeable batteries and supercapacitors is addressed in the tenth chapter. This work provides valuable insights into this emerging field, shedding light on the exciting possibilities of nanomaterials in energy storage applications.

Shifting gears, the book addresses the critical importance of the leather industry in achieving net-zero goals. This eleventh chapter highlights the environmental impact of the leather industry and proposes potential solutions to reduce waste during the manufacturing process. Their innovative approach, including mathematical modeling, paves the way for sustainable practices and aligns with the global net-zero agenda.

The book also covers the exciting field of epoxy-based composite materials for innovative biomedical applications. This twelfth chapter explores the use of epoxy-based composites in the biomedical field, opening doors to advancements in healthcare and medical technology.

Lastly, the book explores the use of material science in preventing cardiovascular diseases.

This book aims to captivate readers from diverse backgrounds, including engineers, scientists, policymakers, students, teachers, and decision-makers. Its accessible language and informative content make it an engaging resource for all those seeking to expand their knowledge and gain insights into the latest advancements across various fields.

We extend our sincere appreciation to the authors who have contributed their expertise and dedication to making this book a reality. Their invaluable contributions have enriched the content and ensured its high quality. We also express our gratitude to the esteemed reviewers who provided valuable feedback and guidance throughout the publication process.

We hope that this book sparks inspiration, fosters collaboration, and stimulates further research and innovation in the areas covered. As editors, it has been a privilege to work with such a talented group of authors and professionals who are at the forefront of their fields.

We extend our heartfelt thanks to the publishers for their support and commitment to disseminating knowledge and promoting advancements in science and technology.

We invite you, the readers, to embark on a captivating journey through the chapters of this book. May the insights and discoveries within these pages expand your horizons, inspire new ideas, and contribute to the advancement of knowledge and the betterment of society.

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