

Preface

The continual push for advanced materials and their functional integration into emerging technologies remains a cornerstone of modern engineering and applied science. This special edition presents research results spanning practically significant materials science domains: polymer engineering, surface treatment and protection, microwave-absorbing materials, and solid electrolytes. These topics reflect the multidisciplinary nature of material innovation and its central role in driving progress across sectors such as aerospace, electronics, energy storage, and defence.

Chapter 1: Polymer Engineering considers issues related to the design, synthesis, processing, and application of polymers with tailored mechanical, thermal, and chemical properties. The chapter covers advances in thermoplastics, biodegradable polymers, polymer blends, etc., highlighting their utility in lightweight structural components and functional materials.

Chapter 2: Surface Treatment, Protection and Inspection focuses on the properties' analysis and synthesis methods of interfaces between materials and external environments. This chapter addresses protective strategies and diagnostic tools to ensure material functionality, reliability and longevity.

Chapter 3: Composites for Microwave Absorption examines the development of electromagnetic wave-absorbing materials, which will be crucial in stealth technology, telecommunications, and electromagnetic interference (EMI) shielding. The chapter emphasises structure-property relationships, filler material innovations, and optimisation strategies for broadband absorption.

Chapter 4: Solid Electrolytes delves into the fast-evolving field of energy storage, particularly solid-state battery technologies. This chapter provides insights into the synthesis and thermal behaviour of Ta-doped LATTaP NASICON-type compounds, solid electrolytes for the next-generation electrochemical devices.

This special edition is a resource for researchers, engineers, and graduate students who are pursuing high-performance materials and their practical deployment in the latest technologies.