Preface

The evolution of materials science and other engineering sciences drives innovation across industries, from metallurgy and processing technologies to sustainable design and functional materials. This special edition presents a collection of study results that illustrate how diverse research directions converge toward a common goal - improving performance, durability, and environmental safety in the development of modern materials and technologies.

Chapter 1: Metallurgical Engineering explores advances in steel metallurgy. There are highlights of some metallurgical innovations that underpin the creation of stronger, more efficient, and more sustainable steel grades for industrial applications.

Chapter 2: Friction Stir Processing focuses on a solid-state technique that refines microstructures and enhances material properties without melting. The chapter discusses the fundamental mechanisms of aluminium alloy friction stir processing and its growing importance for high-performance components of machinery.

Chapter 3: Antibacterial and Antioxidant Materials examines the synthesis and properties analysis of functional materials that prevent microbial growth and oxidative degradation. The studies presented here demonstrate how these materials contribute to healthcare and enhance the effectiveness of protective packaging through their unique chemical and surface properties.

Chapter 4: Sustainable Building Materials focuses on eco-efficient solutions for the construction industry. It presents innovative materials based on renewable resources, recycled aggregates, and low-carbon binders, emphasising the role of sustainable design in reducing the ecological footprint of modern infrastructure.

The special edition will be relevant for many specialists whose activity is related to materials and technologies in various industrial branches and healthcare.