

Preface

In the rapidly evolving field of materials science, the need for comprehensive, accessible knowledge of materials properties and their processing techniques has always been urgent. This special edition is crafted to share research results in three important areas in materials engineering: aluminum and its alloys, additive manufacturing, and polymers and composites. Each chapter covers the fundamental principles and introduces advanced processing technologies.

Assessment of the feasibility of an innovative solid-state recycling process using direct hot rolling in a non-heat-treatable aluminum alloy, numerical simulation methodology applied to optimize the design of extruded aluminium products, etc., are the research topics of the first chapter. This chapter also explores the key properties that make aluminum and its alloys so desirable in many branches of machinery, construction, etc.

Additive manufacturing is one of the most innovative manufacturing processes. This technology has the potential to revolutionize how products are designed, manufactured, and applied across a broad array of industries. The second chapter contains results of an assessment of the structural integrity and mechanical performance of objects printed with gyroid infill compared to other commonly used infill patterns in 3D printing and an analysis of advancements in laser-powered direct energy deposition for parts repair.

The third chapter introduces readers to the results of various polymers and composite materials research and development, which are increasingly recognized for their lightweight and durable properties. These materials have become indispensable in sectors such as construction, electronics, medical devices, and automotive engineering.

We hope this special edition will serve as both a reference and a source of inspiration for investigations in the field of materials and technology.