

# Preface

Materials science plays a pivotal role in the development of modern technologies, influencing industries ranging from aerospace and construction to electronics and sustainable energy. This special edition provides a comprehensive consideration of determinative topics in contemporary materials engineering, structured into four chapters.

The first chapter is devoted to the analysis of metallic materials' properties - mechanical, microstructural etc. and the processing techniques that shape their performance and performance of finished products. Topics include mechanical properties, microstructure control, heat treatment, and modern processing methods such as casting, electrical discharge machining, and additive manufacturing, offering insight into how metals can be engineered for specific applications.

The second chapter focuses on the degradation mechanisms of materials under various stress conditions, this chapter addresses the principles of fatigue, fracture mechanics, and crack propagation. It presents analytical and experimental approaches for understanding material failure, as well as strategies for enhancing durability and reliability in structural components.

Hydrometallurgy, the use of aqueous chemistry for the extraction of metals from ores and concentrates, is discussed in detail in Chapter 3: Hydrometallurgy. It highlights leaching, solution concentration and purification, and metal recovery processes from black powder leaching solution containing several impurities leaching solution.

The final chapter delves into materials engineered for their magnetic and electronic properties, crucial for applications in data storage, batteries, etc.

This special edition aims to serve as a valuable resource for professionals engaged in materials science and engineering. Each chapter is designed to offer both theoretical understanding and practical insights, fostering a deeper appreciation of the complexities and innovations shaping modern materials technology.