

Preface

The evolution of materials and manufacturing technologies shapes the backbone of industrial development and infrastructure. This special edition presents the results of investigations into three areas that define the technological present and future of machinery, materials engineering, and construction: structural metal processing, additive manufacturing, and building materials.

Chapter 1: Processing of Structural Metals examines the conventional and advanced techniques used to manufacture and refine metallic components. Topics include rolling, roll casting, gravity casting, and alloy development, each crucial for enhancing the strength, durability, and formability of metals used in high-load-bearing applications across sectors like aerospace, automotive, civil engineering, etc.

Chapter 2: Additive Manufacturing explores the current situation of layer-by-layer fabrication technologies, commonly also called 3D printing. This chapter covers various additive processes, including powder bed fusion and material extrusion, as well as technological optimisation through generative design, hybrid topology optimisation, and machine learning.

Chapter 3: Building Materials analyses the properties of green concrete and cementitious materials as sustainable alternatives. Emphasis is placed on mechanical performance, environmental impact, and durability, vital for supporting resilient infrastructure and climate-conscious development.

The special edition is intended for researchers, engineers, graduate students, and industry professionals in materials science, mechanical engineering and construction. By bridging traditional and emerging techniques, the book provides a broad yet detailed perspective on the future of engineered materials.