

Preface

Magnetism has been known by human society for thousands of years via the naturally occurred permanent magnets of magnetite (lodestone), which were first recorded in ancient Chinese books as being applied as the Afang Palace doors and the compasses more than two thousand years ago (see chapter 1). The industrial scale production of permanent magnets, from steel magnets to rare-earth magnets, has had a history of only about a hundred years. Nevertheless, permanent magnets have become a kind of indispensable functional materials in modern society, which play essential roles in energy generation and conversion applications. Recently, with the fast development in green-energy technologies such as electric transportation, wind power generation and precision actuation, demand for permanent magnets with high energy density and high thermal stability has become unprecedentedly strong.

This book aims to contribute cutting-edge research progress in advanced permanent magnets. It covers a broad scope from basic theory to application technologies, and from the traditional magnets improvements to novel magnets inventions, as well as materials recycling. The main topics include fundamental coercivity mechanisms of permanent magnets, development of various advanced permanent magnets, and technologies for magnets fabrication and recycling. It contains ten chapters. Chapter 1 is an overview of the history of development of permanent magnets and the perspectives of the future. Chapter 2 focuses on theoretical research of the coercivity mechanisms of permanent nanomagnets. Chapter 3–6 gives the development of several kinds of advanced permanent magnets including Sm-Co magnets, ThMn₁₂-type R-Fe-M magnets, Mn-based magnets, and nanocomposite magnets. Chapter 7–9 introduces the fabrication and modification of rare-earth permanent magnets. Chapter 10 provides the recycling of rare-earth permanent magnet wastes. The authors of the chapters are the leading researchers in the fields in China and the world.

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lated paperwork. We thank all of our authors who provided their in-depth and informative chapters that make this book a reality.

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