

Preface

The fact that the bulk nanostructured metallic materials have been one of the hottest topics in materials science in the last decade clearly shows their growing importance as future materials. For example, small-diameter dental implants made from nanostructured pure titanium are to replace standard ones made from Ti–4Al–6V alloy, since the nanostructured pure titanium is characterized not only by increased mechanical strength and fatigue life, but also by better biocompatibility compared to the conventional Ti–4Al–6V alloy. In other words, one can say that the nanostructured pure titanium is characterized by better multifunctional properties. Despite the significant body of experimental and theoretical research on nanostructured materials in the literature, investigations of their multifunctional properties began within last few years. Many new developments in the area of nanostructured metallic materials have recently occurred, and important new applications are planned, particularly in electrical engineering. Thus, it is hoped that the appearance of this first book is timely.

In preparing this book, we have sought to cover the various features of generation and application of bulk nanostructured metallic materials with multifunctional properties. This book begins with the introduction of bulk nanostructured metallic materials, main techniques developed for their fabrication, and importance of multifunctional approach attempting to enhance their multiple properties at the same time (Chap. 1). The main concepts of a nanostructural design to achieve superior properties are presented and thoroughly discussed in Chap. 2. Multifunctional properties of bulk nanomaterials are considered in detail in Chap. 3. Particular attention is devoted to microstructure—property relationships and the role of individual microstructural features, which provides the central theme. Finally, advantages of current and potential innovative applications of bulk nanomaterials in various engineering sectors are described in detail in Chap. 4.

This book has been written primarily for the researchers working on materials science and engineering of bulk nanostructured metallic materials with superior properties, although we believe it will also serve as a useful guide to both current and potential producers and users of nanostructured materials. For this reason,

books and articles for further reading are listed at the end of each chapter and are augmented by the references included with many of the figures and tables.

The authors would like to acknowledge gratefully numerous collaborators around the world, whose names are presented in the reference list.

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Properties

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