

# Preface

The characterization of materials is an important step to be taken before utilizing the materials for any purpose. It starts from the production of the material, and continues after each processing and/or engineering stage to explore its influence on the structure and properties of the material. Depending on the purpose, one can subject the material to mechanical, thermal, chemical, optical, electrical, and other characterizations to make sure that the material under consideration can function without failure for the life of the final product. Therefore, advances in the materials science are strongly correlated with advances in the characterization technologies. The Characterization of Minerals, Metals, and Materials symposium sponsored by the Materials Characterization Committee of TMS focuses on material characterization from the bulk down to the nano-scale. All characterization techniques and their applications are covered in this symposium. Developments in these techniques and their application in the quantification of the microstructure of materials are essential facets of this symposium. Specific characterization focus areas include catalyst structure, waste and failure characterization, besides structure-property relationships in metals, minerals and materials.

The characterization symposium is a cornerstone symposium in the TMS annual meeting, which attracts materials scientists, metallurgists, mechanical engineers, microscopists, metallographers, from academia and industry from all over the globe. In the TMS 2017 Annual Meeting & Exhibition held in San Diego, California, USA, the characterization symposium received 229 submissions, of which are 137 oral presentations, and 67 will be presented as posters. Of the presented papers, 93 are published in this book after being peer reviewed. The topics of these papers cover a wide range of materials science, metallurgy, physics, chemistry, and engineering of materials. Minerals, ferrous and nonferrous metals, semiconductors, clays, ceramics, alloys, composites, electronic, magnetic, environmental, soft, and advanced materials are widely covered. In addition, research papers about extraction, processing, welding, solidification, corrosion and method development represent a large portion of the presented papers.

This book features original articles and the state-of-the-art reviews on theoretical and practical aspects of the characterization, extraction, processing, structure, and

behavior of minerals, metals, and materials. It is a good reference for academic and industry audiences from advanced undergraduates to seasoned professionals who wish to learn about all types of characterization methods in general, and specifically about real-world applications in the minerals, metals and materials. This book will also be relevant for scientists and engineers engaged in research, development, and production. This book will provide the industry audience with up-to-date information on many types of materials and their characterization with an underlying theme of explaining the behavior of materials using novel approaches.

The reader of this book will learn about all types of characterization methods, their development, and their applications. The reader will enjoy the diversity of topics in this book. He/she will find in this book up-to-date information about bulk materials, thin films, joints and interfaces, powders, slags, micro and nanostructures. The beautiful thing is that this book pays attention to the relationship between production, extraction, processing, recycling, and loading of materials and alloys in practical use. The knowledge gained from this book can be used to prompt innovations in characterization methods and techniques, and to produce new materials with the specific desired properties.

The editors of this book express their sincere thanks and appreciations to the TMS for giving this symposium the opportunity to publish a stand-alone volume. The editors also thank the Materials Characterization Committee for sponsoring this symposium. They also thank the publisher, Springer, for the production of this book, and the authors, who are the core of this scientific work. Finally the editors express their appreciation for the past chairs and members of the Materials Characterization Committee, who built this great symposium and who attracted talented and creative people to the committee, and attracted scientists and research groups from around the world to this symposium.

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