

## PREFACE

This special issue of the journal contains a collection of technical papers that embrace the topic entitled: “**Advances in Understanding the Fatigue Behavior of Materials**”. The focus on “*Fatigue Behavior of Materials*” stems from the changes in properties that occur upon the application of cyclic loads. Since its initiation and sustained growth culminating in increased importance given during the later half of the nineteenth century the topic of fatigue of materials has focused on studying, documenting, interpreting and and rationalizing the engineering approaches that are frequently used to design against the initiation of fatigue damage and ensuing propagation culminating in catastrophic failure or fracture.

Through the time period spanning the last three decades the subject of fatigue behavior of materials has grown to become a major area of scientific and applied research encompassing the disciplines of (a) materials science, spanning the families of metals, ceramics, intermetallics, polymers and their composite counterparts, (b) aerospace engineering, (c) civil engineering, (d) mechanical engineering, (e) biomedical engineering, (f) applied mathematics, and (g) applied physics. In assembling the papers for this special issue, I have attempted to bring together individuals who could in a positive way enhance the prevailing understanding of this topic by providing an overview of the recent advances made in evaluating and assessing the fatigue behavior of ferrous alloys, non-ferrous alloys, shape memory alloys and bulk-metallic glass. Also assembled are papers that provide an insight of the alternative yet viable approaches to studying and understanding the concept of fatigue of materials. It is hoped that the array of technical papers assembled will provide readers with an adequate insight into an understanding of fatigue behavior of materials and a concurrent appreciation of the conjoint influence of processing and microstructure on fatigue response and fracture behavior of both the traditional and emerging material systems. The **twenty-four** papers included in this special issue represent the diverse nature of the subject.

This special issue is divided into four sections. In **Section I**, is a collection of papers that focus on **ferrous alloys**. This is followed by **Section II**, which is a collection of papers with a focus on **non-ferrous alloys**. In **Section III** **shape memory alloy and bulk metallic glass** is the focus. Finally, in **Section IV** the collection of papers focus on presenting **alternative approaches to studying and understanding the fatigue** behavior as it relates to materials and structures.

I am truly grateful to the contributing authors for taking time off from their busy schedule to prepare manuscripts. This special issue could serve as an advanced guide to researchers pursuing their efforts to study, understand, and document the fatigue behavior of materials.

This special issue was initiated with nomination and recommendation of my name by Dr. Enrique J. Lavernia (Dean of Engineering: University of California at Davis, USA). His (Dr. E. J. Lavernia) interest, faith and reliance on my work and capabilities provided the impetus and motivation for my enthusiastic commitment on this project endeavor. I hope that the time, effort and cost spent on this project will help benefit the research endeavors of numerous others who will most certainly benefit from reading this special issue.

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