

Materials Performance and Characterization

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The high quality of the papers that appear in this publication is a tribute not only to the obvious efforts of the authors represented but to the unheralded, though essential, efforts of their reviewers. It is to the reviewers' dedication to upholding the high standards of their profession that this note pays tribute. On behalf of ASTM International and the authors as well, we acknowledge with appreciation their important contribution to the success of this journal.

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Overview: Special Issue on Recent Advances in Hot Deformation of Materials

Hot deformation processing is a critical step in the manufacturing sequence of industrial components, because it not only gives the required shape, but also imparts the desired microstructure to the material. As the microstructure of the material controls the mechanical properties, hot deformation assumes considerable significance and attracts attention of researchers from multiple disciplines involved in manufacturing. When the alloy systems were simple, selection of processing parameters such as deformation temperature, strain rate, strain, and number of reheats for achieving the desired shape used to be primarily based on *trial and error* technique and the technical know-how was more of a trade secret. With the ever-increasing demand of structural designers for advanced materials meeting challenging applications, many complex, tailor-made alloys were designed. These complex alloys needed to be produced in different forms and shapes and demanded science based deformation processing techniques as identifying the thermo-mechanical processing conditions that produce defect-free products became more complex. In order to optimize the thermomechanical processing parameters and obtain defect-free products on a repeatable basis in a manufacturing environment, science based processing techniques were developed. With the advent of powerful computing systems, the laboratory generated test data on standard test specimens could be used to predict the likelihood of flow localization or fracture during thermomechanical processing using various failure criteria for different materials.

It has been a great honor, and a real pleasure, to be asked by the Co-Editors of ASTM International's journal *Materials Performance and Characterization*, Dr. Richard W. Neu and Dr. George E. Totten, to act as a guest editor for the two-part special issue on *Recent Advances in Hot Deformation of Materials*. We were able to attract a large number of excellent papers written by leading scientists and engineers in the area of hot deformation from all over the world for these special issues.

The first part of this two-part special issue includes 24 papers that were submitted and subjected to the peer review process performed by experts from the respective fields. The first article, by Prof. Kashyap, is an authoritative review on the constitutive relationships during superplastic deformation. I have worked under his supervision for my doctoral thesis and he has more than 40 years of experience in the area of superplasticity. The second paper is a review on the hot deformation of 18 percent Nickel maraging steels widely used in several performance critical aerospace applications. The lead author, Dr. Nageswara Rao, has immense experience in the industrial processing of maraging steels and other aerospace products prior to taking up teaching career. The third article on the hot deformation of Magnesium alloy composite is from the group of Prof. Prasad, a highly accomplished researcher in the hot deformation of materials and the man who proposed the concept of *Dynamic Material Modeling* for optimization of hot workability and to control microstructure during hot deformation. I had the good fortune of working under his supervision for my master's thesis. The following 21 papers study the hot deformation behavior of several classes of engineering materials like stainless steels, aluminum, magnesium, titanium and zirconium alloys. Papers related to high temperature phenomena like diffusion bonding, creep of single crystals and constitutive relationships during high temperature deformation were also included in this issue covering many interesting technologies for the readers of this special issue.

The articles here describe the latest advances in the high temperature deformation processing of materials. We sincerely thank both the authors and reviewers for their hard work and dedication.

I wholeheartedly thank the ASTM staff dealing with the issues related to the process of publishing an outstanding journal.

We sincerely hope that you enjoy these papers and look forward to the second part of this special issue that is currently under processing.

S. V. S. Narayana Murty, PhD.

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