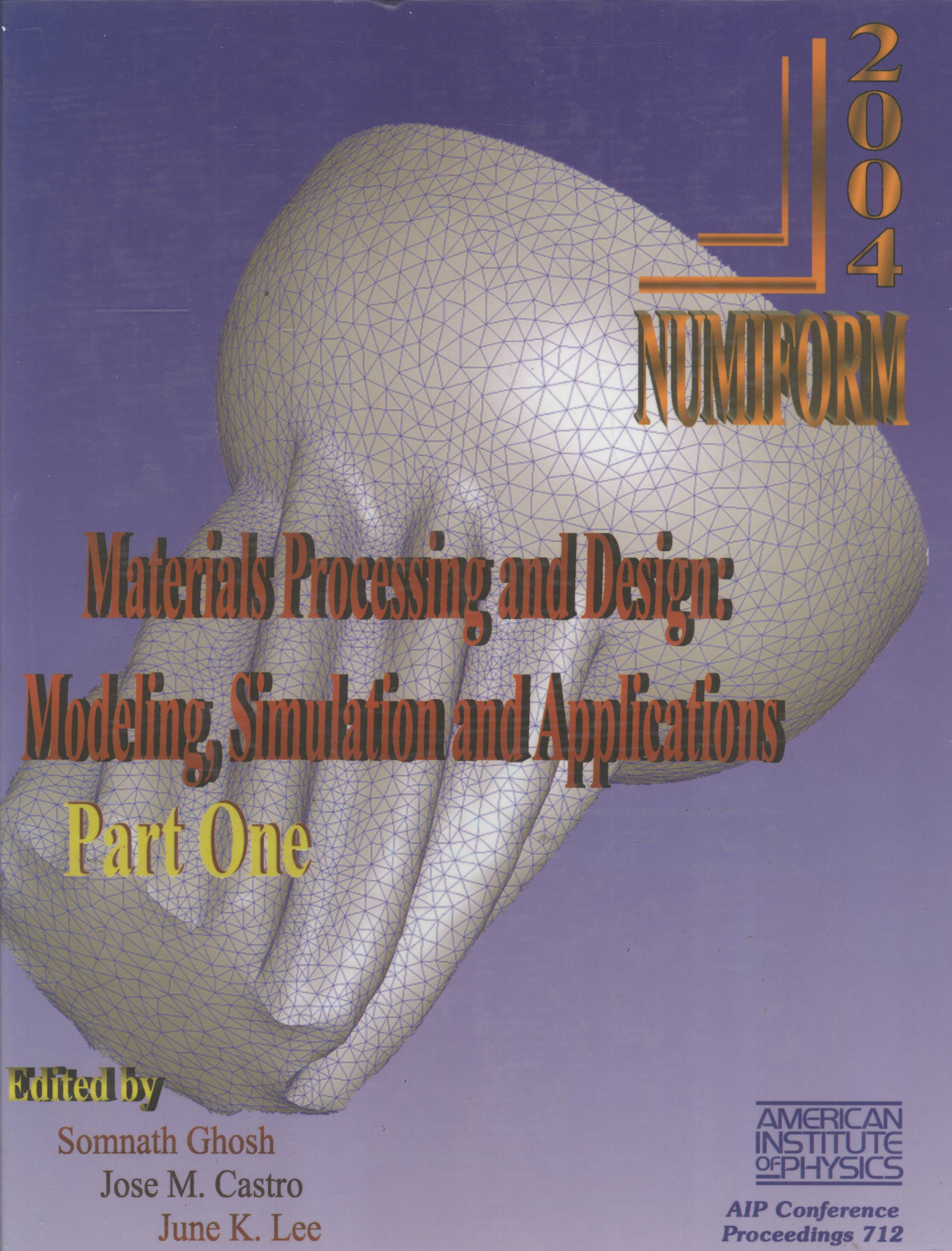




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NUMIFORM

**Materials Processing and Design:
Modeling, Simulation and Applications
Part One**

Edited by

Somnath Ghosh

Jose M. Castro

June K. Lee

AMERICAN
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Modeling, Simulation and Applications

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■ PART ONE



EDITORS

Somnath Ghosh

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*The Ohio State University
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PREFACE

The recent times have seen a surge in efforts on computational modeling of manufacturing processes and materials, as well as in process design. Developments of advanced manufacturing processes and materials, with a wide range of multi-physics applications at various length and time scales, have made accurate and robust modeling a necessity. This can yield better control of manufacturing processes for superior products, improve performance and reliability of advanced materials and innovate new devices and processes. Reliable modeling can reduce requirements of expensive experiments in the product development. The rapid progress in computer technology has made possible the incorporation of a high level of sophistication in the computational methods that is necessary to address these challenges.

The NUMIFORM series of international conferences was founded in the early eighties with a vision of promoting discussion of state of the art and future directions in numerical modeling of metal forming processes. In the last two decades, the conference has evolved significantly with advances in technology. The 8th International Conference on *Numerical Methods in Industrial Forming Processes* NUMIFORM 2004 is held at the Ohio State University to provide a forum for international researchers and practitioners from academia, industry and laboratories to discuss recent advancements and future directions in the modeling of various manufacturing processes and related materials issues. The conference addresses computational modeling and simulations of traditional metals and polymers processing methods, as well as of advanced materials and emerging manufacturing technologies at different scales.

These proceedings comprise many of the papers presented at NUMIFORM 2004. The topics addressed include: *Conventional and emerging methods in materials processing*; *Materials, process and product design at multiple scales*; and *Novel modeling methods*. The proceedings is divided into fifteen subsections based on a broad scope of the subject area. Specifically, they include: (i) Plenary lectures, (ii) Keynote lectures, (iii) Polymer Processing, (iv) Composite Materials and their Processing, (v) Bulk Forming, Rolling, Extrusion, Drawing and Forging, (vi) Sheet Metal Forming, (vii) Hydroforming and Superplastic forming, (viii) Casting, Welding and Sintering, (ix) Machining, (x) Non-Conventional Materials Processing, (xi) Modeling Materials at Micro and Nano-Scales, (xii) Material Characterization and Constitutive Modeling at Different Scales, (xiii) Localization and Damage Modeling in Materials and Processing, (xiv) Process Design and Optimization, (xv) Advances in Numerical Modeling.

The editors of these proceedings would like to thank various generous sponsors of the NUMIFORM 2004 conference. They include the Ohio State University, the National Science Foundation, the Air Force Office of Scientific Research and a number of industries. We would like to thank Dean J. C. Williams for his continued help and support of this conference. We are grateful to all the members of the organizing committee for their support. Finally, the editors are thankful to Ms. Hild Peersen, the NUMIFORM 2004 secretary, for her tireless efforts in making this conference a success.

Somnath Ghosh, Conference Chairman, NUMIFORM 2004
June K. Lee, Co-Chair Scientific Committee
Jose M. Castro, Co-Chair Scientific Committee
The Ohio State University, Columbus, Ohio
March 2004

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