

## Special Issue on Advanced Thermal Processing

Significant advances have been made over the last decade on the study of thermal transport phenomena in manufacturing and material processing, where thermal science has been applied to drive innovations. Powerful experimental tools, as well as multi-scale computational modeling, have been utilized to unravel the associated material transformation and structural modification processes down to a nanoscale, with great detail and unprecedented spatial and temporal resolutions. Such breakthroughs are appearing across a number of disciplines, but a common thread arises within thermal processing. The focus of this special issue is to bring together scientists and engineers across various disciplines to address the thermal aspects of materials processing issues with high societal impact applications.

This special issue was initiated through the organization of a U.S. National Science Foundation-sponsored Symposium on Advanced Thermal Processing, held during the 2008 ASME International Mechanical Engineering Congress & Exposition on November 5, 2008 in Boston, MA.<sup>1</sup> The ASME Heat Transfer Division's K-15 Technical Committee on Transport Phenomena in Manufacturing and Materials Processing organized a multisession symposium during which experts were invited from industry, research laboratories, and academia to present the latest thermal processing challenges in their field. Topics discussed included nuclear energy, nanomanufacturing, photovoltaics, fuel cells, tissue engineering, and photonics. Both speakers and attendees were invited to contribute to this special issue.

On behalf of the ASME Heat Transfer Division's K-15 Technical Committee on Transport Phenomena in Manufacturing and Materials Processing, we are honored to present this special issue consisting of 12 technical and review articles. Contributions cover various aspects of advanced thermal processing, including the synthesis of novel nanomaterials, multiphase flow with applications to welding, machining, thermal management, fuel cells, food processing, thermal barrier coatings, and materials processing challenges in novel scaffold materials for tissue engineering. We hope that these papers inspire further research and innovation in thermal science application in manufacturing and materials processing.

Organizing this special edition on advanced thermal processing

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<sup>1</sup><http://www.engr.uconn.edu/nsfworkshop>.