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# EDITORIAL

*Innovative Solutions for Shaping and Forming of High Strength Steel, Titanium, and Light Metals*




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Promoting next-generation materials to improve fuel economy and enhance performance under extreme conditions is a pivotal challenge currently facing the materials community. The recent effort to incorporate new aluminum, magnesium, steel, and titanium alloys has had a considerable impact throughout the oil, gas, and transportation (automobile and aerospace) industries. In general, introduction of new materials into existing systems can be an expensive and time-consuming process, which often requires new forming protocols and/or numerous design iterations to achieve the desired properties. Because they can effectively mitigate some of the development issues, numerical formability predictions have become integral components in the development process. However, the accuracy of these complex models is highly dependent on the quality of the property data used, and for many of these new alloys, such data can be quite limited. The inconsistencies that still frequently arise between the predicted behavior and what is actually observed have precipitated an industry-wide demand for more accurate and reliable characterizations of the mechanical behavior of new alloys under a wide range of conditions.

This issue features a set of selected articles that were presented during the ''Shaping and Forming of High Strength Steel, Titanium, and Light Metals'' symposium. The symposium was part of the Materials Science & Technology 2010 (MS&T2010) conference, which was held in October in Houston, Texas. This conference, held annually, was sponsored by a consortium of materials professional societies comprising the ASM International, The American Ceramic Society (ACeRS), The Association for Iron & Steel Technology (AIST), The National Association of Corrosion Engineers (NACE), and The Minerals, Metals & Materials Society (TMS). Our symposium was a forum for discussion of innovative solutions to the numerous challenges associated with the development and implementation of medium- to high-strength steels, nickel- and titanium-based super alloys, aluminum alloys, and magnesium alloys. The two-day event consisted of four sessions: Processing and Modeling (parts I and II), Microstructure Evolution During Processing, and Processing Defect and Sensitivity.

The two ''Processing and Modeling'' sessions featured discussions on recent key developments in friction stir welding, grain orientation analyses, ultrasonic-assisted forming, hot gas pressure bulge forming, and rotary-die equal channel angular pressing. The ''Microstructure Evolution During Processing'' session featured fundamental research on the microstructure and crystallographic texture produced through severe plastic, multiple cold-rolling, and multi-axial deformation methods in transformation-induced plasticity (TRIP) steels, magnesium alloys, aluminum-magnesium-silicon alloys, and cold-sprayed nickel and titanium alloys. The ''Processing Defect and Sensitivity'' session featured presentations on novel hemming technologies, localization and failure analyses using high-resolution electron backscattered diffraction (EBSD) and scanning laser confocal microscopy techniques, development of forming limit diagrams, and characterization of laminate materials. The intent of this set of articles is to capture a sampling of the new technologies that were presented during this event and provide a glimpse into the future of advanced materials research.

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