

Special Issue: Innovations in Materials Forming Processes

This special issue of the ASME *Journal of Manufacturing Science and Engineering* is devoted to Innovations in Materials Forming Processes for forming and solid-state joining of metallic and nonmetallic materials, in bulk or in sheet form. Material forming via plastic deformation has been widely used for mass production in the manufacturing industry, which has a significant broader impact on society, for example, in both the automotive and aerospace industries. As a response to shifting societal trends, new industrial technologies and new knowledge are being produced at ever-increasing rates.

Societal needs and government regulations require vehicles that are safe, lightweight, and that have reduced fuel consumption and reduced CO₂ gas emissions. Moreover, the transportation industry is migrating toward usage of mixed materials. This practice leads to integrated structures with multimaterials, which are potentially dissimilar in alloys, grades, gauges, and tempers. As a result, the industry is motivated to develop energy-efficient and sustainable forming and joining processes to alleviate the current technical challenges in making these structures efficiently and cost effectively. This has led to significant initiatives in continuous and synergistic development of not only new lightweight materials but also innovative methods of forming and joining of dissimilar materials. The overall industrial scenario is complicated by an increasing digitalization of supply chains, which reduces average production lots toward mass customization at an alarming rate. It calls for adoption of more advanced and flexible processes, such

as those presented herein, in order to address the production issues.

To meet the above needs, new forming and solid-state joining technologies are being developed, along with an increasing knowledge of materials behavior, advanced material models, better accuracy, and efficient numerical techniques. This special issue collects papers that can enhance the understanding of material deformation processes, expand the area of lightweight material forming and multimaterial joining processes, development of corresponding modeling capabilities, and dissemination of R&D on forming and joining of new materials. Additionally, material deformation-based solid-state joining processes are addressed in this special issue. We are grateful to the Journal Leadership for recognizing the relevance and vitality of this research field and to the community for responding enthusiastically to our call for papers. As a result, this issue contains 15 papers with 12 papers on forming and 3 papers on deformation-based solid-state joining. Novel processes, such as double-sided incremental forming, incremental profile forming, laser-based sheet forming, and microblanking, have also found a home in this collection. We would like to thank the authors for submitting their work to this special issue, as well as the reviewers whose prompt responses enabled the publication of this special issue in a timely manner. It is the sincere hope of the Guest Editors that the readers find this collection of papers worthwhile in furthering their investigations of the many remaining unanswered questions in forming and deformation-based solid-state joining.



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