
Editorial

This special issue of the *Journal of Materials Engineering and Performance* (JMEP) is dedicated entirely to topics related to superplasticity, presented orally at the AeroMat Conference in Seattle, Washington, June 7-9, 2004.

The material science studies related to superplasticity and the manufacturing development of the superplastic forming (SPF) process have given the engineering world a dramatic leap forward in just the past two years. The SPF process had previously been identified with low-volume production operations, primarily for specialty aerospace parts, high-end luxury sports car hardware, rail car interiors, unique architectural artwork, and high-priced exotic metal alloys. It is now clear that the new superplastic aluminum alloys and the basic process itself have evolved to allow the fabrication of mainstream automobile parts, including some individual 5083-SP alloy sheet metal parts that will total more than 100,000 pieces shipped during 2004.



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The cost of titanium SPF parts that are used to build monolithic aircraft structures has also been reduced, such that the process has become very competitive against alternatives such as hydropress formed details, drop hammer stampings, welded fabrications, composite moldings, and built-up assemblies. Lower-temperature forming materials, new finite-element modeling techniques, rapid prototyping, ceramic tooling, and other innovative processing procedures have all contributed to significantly reduce the cost.

None of these advancements would have been possible without the teaming of scientists at the universities, government laboratories, and industrial operations. Indeed, it is clear that the efforts of a few dedicated individuals associated with ASM's Committee for the Advancement of Superplasticity and Superplastic Forming are responsible for bringing researchers and manufacturing technologists together to work as a coordinated team. Many academics had abandoned their SPF studies during the period of 1998 to 2003. Others chose to work alone in their closed laboratories and purposely avoided the sharing of data. It is only through the efforts of a small number of people who carried on with the difficult work of resolving the lingering material and processing roadblocks that this publication is possible. Despite all of the technical issues, funding setbacks, and academic pressures to move on to more exciting scientific prospects, these researchers have carried us through to our surprisingly high level of success in growing the SPF business worldwide.

Several new materials and processing technologies are discussed in this special edition of JMEP, including studies of Zircodyne 705, variable strain rate forming, quick plastic forming of aluminum for automobiles, diffusion bonding combined with SPF for aerospace parts, and a thorough characterization of alpha case that forms during SPF of titanium. I want to thank the authors for making an extraordinary effort of reformatting, revising, and expanding their papers for this special journal venue. I also owe a tremendous debt of gratitude to my assistant editors, Dr. David Dunand, Franna Pitt, Dr. Mamidala Ramulu, and Ellyn Vander Kaay, for their outstanding individual editing contributions and coordination efforts.

On a personal note, it has been my unique honor to have had the chance not only to work with some of the original pioneers in the manufacturing of the titanium SPF and diffusion bonding process at Boeing (including the former North American Rockwell group and McDonnell Douglas groups), but also to meet with my colleagues at the many research communities around the world during the yearly ASM AeroMat conferences and the International Conference on Superplasticity in Advanced Materials (ICSAM) meetings, which occur every three years. It is this comradeship that I find to be the most rewarding.

Finally, I am also thankful to have been given this opportunity by Jeff Hawk, the editor of ASM's JMEP, and his staff to share our most recent SPF works. Because of the success achieved here, we are already planning to create a second special SPF edition of JMEP following the AeroMat conference, which has been scheduled for June 6-9, 2005 in Orlando, Florida.

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