MateriAlZ Seminar Series

Retrogression forming and reaging of high-strength aluminum alloys

Friday, October 23, 2020, 11:00 am MST

Abstract

A persistent barrier to the increased use of aluminum alloys in automobiles and other transportation applications is the difficulty of simultaneously achieving both improved formability and high service strength through processes that are economically feasible for mass production. This presentation describes a technique developed to address this problem. Retrogression forming and reaging (RFRA) is a new warm-forming process designed to produce automotive structural components from high-strength, age-hardenable aluminum alloys. RFRA takes advantage of a retrogression heat treatment during warm forming to significantly increase ductility over that at room temperature while enabling the recovery of strength after forming. A single reaging heat treatment after warm forming fully recovers the strength of the original T6 temper. A scientific approach is described to determine appropriate RFRA conditions for AA7075-T6 and is applied to laboratory-scale forming experiments. The concept of reduced time is used with the activation energy of retrogression measured for AA7075-T6 to predict appropriate times and temperatures for retrogression forming. In forming trials, an AA7075-T6 Alclad sheet was formed into a complex component at 200 °C. Reaging this component at 120 °C for 24 h fully restored the strength of the T6 temper. Data from mechanical tests are presented to describe flow stresses and tensile ductilities across the range of conditions appropriate for RFRA.

Prof. Eric M. Taleff
The University of Texas at Austin
Mechanical Engineering/Texas Materials Institute

Prof. Taleff is the Charlotte Maer Patton Centennial Fellow in Engineering in the Department of Mechanical Engineering and a member of the Texas Materials Institute at The University of Texas at Austin. He is a Fellow of ASM International and a Brimacombe Medalist of The Mineral, Metals & Materials Society. He is a recipient of the AIME Champion H. Mathewson Medal Award and the General Motors Most Valuable Colleague Award. His research addresses issues in physical and mechanical metallurgy, with an emphasis on the process-microstructure-property relationships in metals and their alloys.

Zoom link: https://asu.zoom.us/j/83866995895