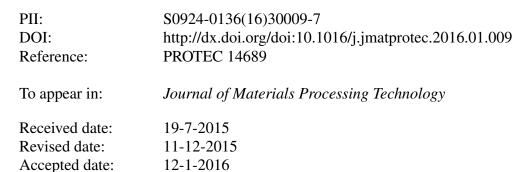
Accepted Manuscript

Title: Detailed thermal and material flow analyses of Friction Stir Forming using a three-dimensional particle based model

Author: Timothy Fagan Vincent Lemiale John Nairn Yogita Ahuja Raafat Ibrahim Yuri Estrin



Please cite this article as: Timothy Fagan, Vincent Lemiale, John Nairn, Yogita Ahuja, Raafat Ibrahim, Yuri Estrin, Detailed thermal and material flow analyses of Friction Stir Forming using a three-dimensional particle based model, <*![CDATA[Journal of Materials Processing Tech.]]*> (2016), http://dx.doi.org/10.1016/j.jmatprotec.2016.01.009

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



ACCEPTED MANUSCRIPT

Detailed thermal and material flow analyses of Friction Stir Forming using a three-dimensional particle based model

Timothy Fagan^{a,b}, Vincent Lemiale^{a,*}, John Nairn^c, Yogita Ahuja^b, Raafat Ibrahim^b, Yuri Estrin^d

^aCSIRO Data61, Clayton South, VIC 3169, Australia ^bDepartment of Mechanical and Aerospace Engineering, Monash University, Clayton, VIC 3800, Australia ^cWood Science & Engineering, Oregon State University, USA ^dDepartment of Materials Science and Engineering, Monash University, Clayton, VIC 3800, Australia

Abstract

The Material Point Method is proposed as a framework to model friction stir forming. The flexibility of the method allows for the development of a fully coupled thermo-mechanical model which includes heat transfer processes due to plastic dissipation as well as frictional heating. A procedure is proposed to fully determine all numerical parameters from experimental data, thus eliminating the need for further calibration of the results. The model was used to gain insight into heat transfer mechanisms and material flow in friction stir forming of copper plates. Experimental verification of the results confirmed the predictive capability of the model. The predicted temperatures were in satisfactory agreement with thermocouple data while the material flow in the model compared reasonably well with experiments, thus providing a useful tool for analysing the complex physical mechanisms at play in friction stir forming.

Keywords: Friction Stir Forming, Friction Stir Processing, Material Point Method, material flow, large deformations, modeling

1

Download English Version:

https://daneshyari.com/en/article/7176769

Download Persian Version:

https://daneshyari.com/article/7176769

Daneshyari.com