

Numerical simulation and experimental investigation on the residual stresses in a laser beam welded dual phase DP600 steel plate: thermo-mechanical material plasticity model

S. Liu, A. Kouadri-Henni, A. Gavrus



PII: S0020-7403(17)30022-X
DOI: <http://dx.doi.org/10.1016/j.ijmecsci.2017.01.006>
Reference: MS3544

To appear in: *International Journal of Mechanical Sciences*

Received date: 31 July 2016
Revised date: 28 November 2016
Accepted date: 4 January 2017

Cite this article as: S. Liu, A. Kouadri-Henni and A. Gavrus, Numerical simulation and experimental investigation on the residual stresses in a laser beam welded dual phase DP600 steel plate: thermo-mechanical material plasticity model, *International Journal of Mechanical Sciences* <http://dx.doi.org/10.1016/j.ijmecsci.2017.01.006>

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 galley proof before it is published in its final citable 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.

Numerical simulation and experimental investigation on the residual stresses in a laser beam welded dual phase DP600 steel plate: thermo-mechanical material plasticity model

S. LIU, A. KOUADRI-HENNI*, A. GAVRUS

Université Bretagne Loire (UBL), France

INSA Rennes-LGCGM-EA 3913, 20 avenue des Buttes de Coësmes, 35708, Rennes, France

Abstract

A thermo-mechanical plasticity material model, which consists of a hardening and a temperature sensitivity term, is built to describe the dual phase DP600 steel behavior. For the hardening term, a synthesis Ludwik - Voce hardening law is proposed, identified and compared with the classical Ludwik and the Voce hardening laws. For the temperature sensitivity function, a new proposed expression together with a classical Johnson-Cook term and an improved Chen term are analyzed and identified. Moreover, the plate anisotropy of DP600 is also taken into account using Hill-48 theory. Based on the plasticity material model, a numerical sequential coupled thermo-mechanical model is applied to investigate the residual stresses of laser welding process. It is shown that the material anisotropy and the thermo-mechanical elastic-plastic model have an important influence on numerical residual stresses results. An experiment is also carried out to verify the numerical model. Simulation results of residual stresses are in good accordance with neutrons diffraction measurements.

Keywords: Constitutive Equations, Anisotropy, Laser Welding, DP600 Dual Phase Steel Behavior, Residual Stress, Neutron Diffraction

*email address: afia.kouadri-henni@insa-rennes.fr

Download English Version:

<https://daneshyari.com/en/article/5016083>

Download Persian Version:

<https://daneshyari.com/article/5016083>

[Daneshyari.com](https://daneshyari.com)