

Accepted Manuscript

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PII: S0749-6419(15)00208-9

DOI: [10.1016/j.ijplas.2015.12.009](https://doi.org/10.1016/j.ijplas.2015.12.009)

Reference: INTPLA 1999

To appear in: *International Journal of Plasticity*

Received Date: 7 August 2015

Revised Date: 11 December 2015

Accepted Date: 12 December 2015

Please cite this article as: Kim, E.-Y., Woo, W., Huh, Y.-U., Seong, B., Choi, J., Choi, S.-H., Effect of kinematic stability of the austenite phase on phase transformation behavior and deformation heterogeneity in duplex stainless steel using the crystal plasticity finite element method, *International Journal of Plasticity* (2016), doi: 10.1016/j.ijplas.2015.12.009.

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Effect of kinematic stability of the austenite phase on phase transformation behavior and deformation heterogeneity in duplex stainless steel using the crystal plasticity finite element method

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Abstract

The crystal plasticity finite element method (CPFEM) was applied to determine the influence that the kinematic stability of the austenite (γ) phase exerts on the phase-transformation behavior and deformation heterogeneity of duplex stainless steel (DSS) showing γ to martensite (α') transformation during uniaxial tension. A phase-transformation model was implemented in the CPFEM to consider the effect of transformation-induced plasticity (TRIP) on micromechanical behaviors in DSS. The individual flow curves of the ferrite (α), γ and α' phases in DSS were determined via *in-situ* neutron diffraction in combination with the CPFEM. The effect of the kinematic stability of the γ phase on phase-transformation behavior and deformation heterogeneity in DSS during uniaxial tension was demonstrated using the CPFEM based on the representative volume elements (RVEs) of a unit cell for DSS.

Keywords: Neutron diffraction; Duplex stainless steel; Phase transformation; Crystal plasticity; Kinematic stability

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