

## Accepted Manuscript

Multiphase-field modeling of martensitic phase transformation in a dual-phase microstructure

Ephraim Schoof, Daniel Schneider, Nick Streichhan,  
Tobias Mitnacht, Michael Selzer, Britta Nestler

PII: S0020-7683(17)30494-8  
DOI: [10.1016/j.ijsolstr.2017.10.032](https://doi.org/10.1016/j.ijsolstr.2017.10.032)  
Reference: SAS 9784



To appear in: *International Journal of Solids and Structures*

Received date: 29 May 2017  
Revised date: 12 October 2017  
Accepted date: 27 October 2017

Please cite this article as: Ephraim Schoof, Daniel Schneider, Nick Streichhan, Tobias Mitnacht, Michael Selzer, Britta Nestler, Multiphase-field modeling of martensitic phase transformation in a dual-phase microstructure, *International Journal of Solids and Structures* (2017), doi: [10.1016/j.ijsolstr.2017.10.032](https://doi.org/10.1016/j.ijsolstr.2017.10.032)

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.

# Multiphase-field modeling of martensitic phase transformation in a dual-phase microstructure

Ephraim Schoof<sup>a,\*</sup>, Daniel Schneider<sup>a,b</sup>, Nick Streichhan<sup>a</sup>, Tobias Mitnacht<sup>b</sup>, Michael Selzer<sup>a,b</sup>, Britta Nestler<sup>a,b</sup>

<sup>a</sup>*Institute of Materials and Processes (IMP), Karlsruhe University of Applied Sciences, Moltkestrasse 30, 76133 Karlsruhe, Germany*

<sup>b</sup>*Institute of Applied Materials (IAM-CMS), Karlsruhe Institute of Technology, Kaiserstrasse 12, 76131 Karlsruhe, Germany*

---

## Abstract

Ferritic-martensitic dual-phase steels (DP) offer beneficial material properties for industrial applications. Understanding the microstructural evolution within the production chain and its consequences for the mechanical characteristics allows to improve the material properties by changing specific process parameters. In addition to experiments, numerical methods are a helpful tool to explore these correlations. For this purpose, we present an elastic multiphase-field model to study the martensitic phase transformation in a DP microstructure. An EBSD scan of an as-received commercial DP600 finished strip is used to generate a virtual, initial ferritic-austenitic microstructure. Based on the initial polycrystalline microstructure, the applied multiphase-field model is able to predict the evolution of the martensitic variants in austenitic grains, including grain boundary and autocatalytic nucleation. The approach identifies grain boundaries lying parallel or perpendicular to the habit plane of martensitic variants as preferred nucleation sites. We discuss the resulting stress distribution and show its correlations to retained austenite.

**Keywords:** Multiphase-field model, Dual-phase steel, Martensitic phase transformation, Microstructure evolution, Polycrystals

---



---

\*Corresponding author

Email address: [ephraim.schoof@hs-karlsruhe.de](mailto:ephraim.schoof@hs-karlsruhe.de) (Ephraim Schoof)

Download English Version:

<https://daneshyari.com/en/article/6748433>

Download Persian Version:

<https://daneshyari.com/article/6748433>

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