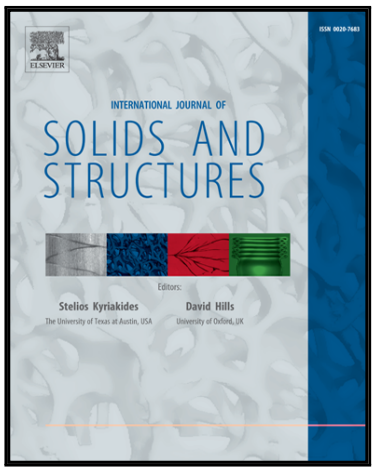

Computational assessment of the microstructure-dependent plasticity of lamellar gray cast iron - Part IV: Assessment of the yield surface after plastic loading

M. Metzger, T. Seifert

PII: S0020-7683(18)30067-2
DOI: 10.1016/j.ijsolstr.2018.02.020
Reference: SAS 9908

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

Received date: 6 April 2017
Revised date: 15 December 2017
Accepted date: 12 February 2018

Please cite this article as: M. Metzger, T. Seifert, Computational assessment of the microstructure-dependent plasticity of lamellar gray cast iron - Part IV: Assessment of the yield surface after plastic loading, *International Journal of Solids and Structures* (2018), doi: 10.1016/j.ijsolstr.2018.02.020

Computational assessment of the microstructure-dependent plasticity of lamellar gray cast iron - Part IV: Assessment of the yield surface after plastic loading

M. Metzger[a,b,*], T. Seifert[a]

[a] *Offenburg University of Applied Sciences, Badstraße 24, 77652 Offenburg, Germany*
[b] *Fraunhofer Institute for Mechanics of Materials IWM, Wöhlerstraße 11, 79108 Freiburg, Germany*

Abstract

In this paper the yield surface of a recently presented microstructure-based volume element of the gray cast iron material GJL-250 is assessed after different plastic loading histories. The evolution of the yield surface is investigated for different volumetric, deviatoric and uniaxial loadings. The micromechanical material properties of the metallic matrix and the graphite inclusions are validated by means experimental stress-strain hysteresis loops. The metallic matrix is modeled as elastic-plastic with a non-linear kinematic hardening law. The graphite inclusions are described by means of a volumetric strain state dependent Young's modulus. The results show that the shape of the yield surface does not change significantly in comparison to the initial yield surface after pure deviatoric loadings. After volumetric loadings, the dependence of the material on the Lode angle is significantly reduced. Uniaxial

*Corresponding author at: Fraunhofer Institute for Mechanics of Materials IWM, Wöhlerstraße 11, 79108 Freiburg, Germany, E-mail: mario.metzger@iwm.fraunhofer.de