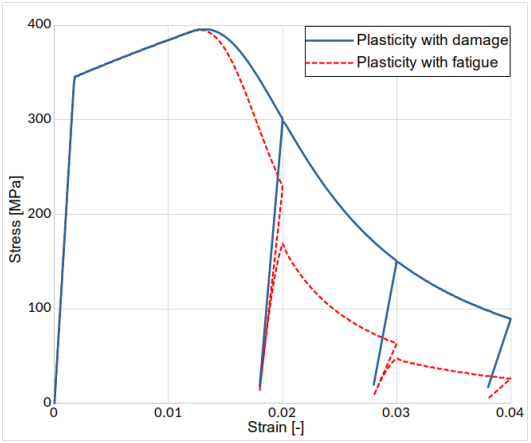
PHASE-FIELD FATIGUE MODELING IN DUCTILE MATERIALS

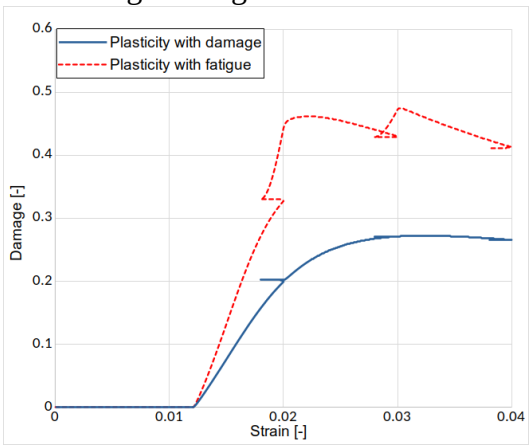
Vladimir Lj. Dunić[1*], Miroslav M. Živković[1] and Vladimir P. Milovanović[1]

[1] Faculty of Engineering University of Kragujevac, Sestre Janjić 6 34000 Kragujevac Serbia,
dunic@kg.ac.rs, miroslav.zivkovic@kg.ac.rs, vladicka@kg.ac.rs, www.fink.rs

Key Words: *low cyclic loading, plasticity, phase-field fatigue modeling, damage*

Plastic strains occur in ductile materials if the loading stress exceeds the yield strength. If that state repeats, the material experiences low cyclic fatigue (LCF), which leads to a fracture after fewer cycles compared to high cyclic fatigue (HCF) when the loading stress is below the yielding limit. Both LCF and HCF behavior can be simulated by Phase-Field Fatigue Modeling (PFFM), which includes a fatigue degradation function. In this work, the cyclic tensile loading-unloading behavior is simulated by PAK-DAM finite element method software using the Von Mises plasticity constitutive model and Simo's hardening function. The material parameters are determined for generic material with the phase-field constants set to show the phenomena. The results show that the proposed theory can simulate fatigue behavior in low cyclic loading conditions. However, further experimental testing of ductile materials under cyclic loading and fatigue conditions is needed for advanced simulation of engineering structures.





The research was supported by the Science Fund of the Republic of Serbia, #GRANT No 7475, Prediction of damage evolution in engineering structures - PROMINENT and by the University of Kragujevac project for young scientist Developing the procedure for damage simulation in metallic structures due to cyclic loading - DEEDS.

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