Azinpour, E.; **Cruz, D. J.**; **de Sa, J. M. A. Cesar**; **Santos, A.**

Phase-field approach in elastoplastic solids: application of an iterative staggered scheme and its experimental validation. (English) Zbl 1480.74283

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Summary: The numerical assessment of the crack development in structures subjected to plastic deformations using a phase-field approach is investigated in the present study. By relying on distinctive features of phase-field diffusive crack concept, a recently-developed iterative staggered algorithm is employed for implementation of the overall system of equations, in which one can achieve results that are insensitive to the chosen value of the load increment. This procedure offers advantage in convergence at rather less computational time than the popular standard staggered algorithms, while it maintains the desired solution accuracy. By emphasizing the application of this numerical treatment in phase-field concept in an elastoplastic material framework, the choice of utilizing a plastic work threshold value and its influence on inelastic and post-critical material behavior is elaborated. The numerical performance of the specified phase-field model is evaluated using existing fracture benchmarks in literature, as well as, from a performed experimental tensile test sample.

MSC:

74R20 Anelastic fracture and damage
74C05 Small-strain, rate-independent theories of plasticity (including rigid-plastic and elasto-plastic materials)
74N99 Phase transformations in solids
74S05 Finite element methods applied to problems in solid mechanics

Keywords:

phase-field diffusive crack; iterative staggered algorithm; elastoplastic solid; plastic work threshold; finite element simulation

Software:

ABAQUS

Full Text: DOI

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