On the homogenization of metal matrix composites using strain gradient plasticity - DTU Orbit (10/01/2019)

On the homogenization of metal matrix composites using strain gradient plasticity
The homogenized response of metal matrix composites (MMC) is studied using strain gradient plasticity. The material model employed is a rate independent formulation of energetic strain gradient plasticity at the micro scale and conventional rate independent plasticity at the macro scale. Free energy inside the micro structure is included due to the elastic strains and plastic strain gradients. A unit cell containing a circular elastic fiber is analyzed under macroscopic simple shear in addition to transverse and longitudinal loading. The analyses are carried out under generalized plane strain condition. Micro-macro homogenization is performed observing the Hill-Mandel energy condition, and overall loading is considered such that the homogenized higher order terms vanish. The results highlight the intrinsic size-effects as well as the effect of fiber volume fraction on the overall response curves, plastic strain distributions and homogenized yield surfaces under different loading conditions. It is concluded that composites with smaller reinforcement size have larger initial yield surfaces and furthermore, they exhibit more kinematic hardening.

General information
State: Published
Organisations: Department of Mechanical Engineering, Solid Mechanics
Contributors: Azizi, R., Niordson, C. F., Legarth, B. N.
Pages: 175-190
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Acta Mechanica Sinica
Volume: 30
Issue number: 2
ISSN (Print): 0567-7718
Ratings:
Web of Science (2019): Indexed yes
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 1.67 SJR 0.409 SNIP 0.745
Web of Science (2017): Impact factor 1.545
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.36 SJR 0.378 SNIP 0.743
Web of Science (2016): Impact factor 1.324
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 1.04 SJR 0.375 SNIP 0.874
Web of Science (2015): Impact factor 0.832
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 1.09 SJR 0.314 SNIP 0.806
Web of Science (2014): Impact factor 0.887
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 0.95 SJR 0.314 SNIP 0.85
Web of Science (2013): Impact factor 0.616
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 0.94 SJR 0.361 SNIP 0.869
Web of Science (2012): Impact factor 0.688
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 1 SJR 0.279 SNIP 0.729
Web of Science (2011): Impact factor 0.86
ISI indexed (2011): ISI indexed yes