A novel numerical framework for self-similarity in plasticity: Wedge indentation in single crystals - DTU Orbit (25/12/2018)

**A novel numerical framework for self-similarity in plasticity: Wedge indentation in single crystals**

A novel numerical framework for analyzing self-similar problems in plasticity is developed and demonstrated. Self-similar problems of this kind include processes such as stationary cracks, void growth, indentation etc. The proposed technique offers a simple and efficient method for handling this class of complex problems by avoiding issues related to traditional Lagrangian procedures. Moreover, the proposed technique allows for focusing the mesh in the region of interest. In the present paper, the technique is exploited to analyze the well-known wedge indentation problem of an elastic-viscoplastic single crystal. However, the framework may be readily adapted to any constitutive law of interest. The main focus herein is the development of the self-similar framework, while the indentation study serves primarily as verification of the technique by comparing to existing numerical and analytical studies. In this study, the three most common metal crystal structures will be investigated, namely the face-centered cubic (FCC), body-centered cubic (BCC), and hexagonal close packed (HCP) crystal structures, where the stress and slip rate fields around the moving contact point singularity are presented.

**General information**

State: Published
Organisations: Department of Mechanical Engineering, Solid Mechanics, Columbia University
Contributors: Juul, K. J., Niordson, C. F., Nielsen, K. L., Kysar, J. W.
Pages: 667-684
Publication date: 2018
Peer-reviewed: Yes

**Publication information**

Journal: Journal of the Mechanics and Physics of Solids
Volume: 112
ISSN (Print): 0022-5096
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 4.03 SJR 1.988 SNIP 1.83
Web of Science (2017): Impact factor 3.566
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.33 SJR 2.231 SNIP 2.107
Web of Science (2016): Impact factor 4.255
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 4.29 SJR 2.444 SNIP 2.154
Web of Science (2015): Impact factor 3.875
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 4.7 SJR 2.642 SNIP 2.319
Web of Science (2014): Impact factor 3.598
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 4.43 SJR 2.604 SNIP 2.256
Web of Science (2013): Impact factor 4.289
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 3.5 SJR 2.229 SNIP 2.054
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 3.6 SJR 2.799 SNIP 2.25
Web of Science (2011): Impact factor 2.806
ISI indexed (2011): ISI indexed yes