

## A micro-mechanical analysis of thermo-elastic properties and local residual stresses in ductile iron based on a new anisotropic model for the graphite nodules - DTU Orbit (09/11/2017)

### A micro-mechanical analysis of thermo-elastic properties and local residual stresses in ductile iron based on a new anisotropic model for the graphite nodules: Paper

In this paper, the thermo-elastic behavior of the graphite nodules contained in ductile iron is derived on the basis of recent transmission electron microscopy investigations of their real internal structure. The proposed model is initially validated by performing a finite element homogenization analysis to verify its consistency with the room-temperature elastic properties of ductile iron measured at the macro scale. Subsequently, it is used to investigate the formation of local residual stresses around the graphite particles by simulating the manufacturing process of a typical ferritic ductile iron grade, and the results are compared with preliminary measurements using synchrotron x-rays. Finally, the obtained accurate description of the stress & strain field at the micro scale is used to shed light on common failure modes reported for the nodules and on some peculiar properties observed in ductile iron at both micro and macro scale.

#### General information

State: Published

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Publication date: 2016

Main Research Area: Technical/natural sciences

#### Publication information

Journal: Modelling and Simulation in Materials Science and Engineering

Volume: 24

Issue number: 5

Article number: 055012

ISSN (Print): 0965-0393

Ratings:

BFI (2017): BFI-level 2

Web of Science (2017): Indexed yes

BFI (2016): BFI-level 2

Scopus rating (2016): SJR 0.932 SNIP 0.86 CiteScore 1.82

Web of Science (2016): Indexed yes

BFI (2015): BFI-level 2

Scopus rating (2015): SJR 1.05 SNIP 0.844 CiteScore 1.73

BFI (2014): BFI-level 2

Scopus rating (2014): SJR 1.099 SNIP 0.992 CiteScore 1.81

Web of Science (2014): Indexed yes

BFI (2013): BFI-level 2

Scopus rating (2013): SJR 0.647 SNIP 0.756 CiteScore 1.25

ISI indexed (2013): ISI indexed yes

BFI (2012): BFI-level 2

Scopus rating (2012): SJR 1.266 SNIP 1.545 CiteScore 2.05

ISI indexed (2012): ISI indexed yes

Web of Science (2012): Indexed yes

BFI (2011): BFI-level 2

Scopus rating (2011): SJR 1.128 SNIP 1.31 CiteScore 1.96

ISI indexed (2011): ISI indexed yes

BFI (2010): BFI-level 2

Scopus rating (2010): SJR 1.241 SNIP 1.31

Web of Science (2010): Indexed yes

BFI (2009): BFI-level 2

Scopus rating (2009): SJR 1.162 SNIP 1.167

Web of Science (2009): Indexed yes

BFI (2008): BFI-level 1

Scopus rating (2008): SJR 1.277 SNIP 1.102

Web of Science (2008): Indexed yes

Scopus rating (2007): SJR 0.949 SNIP 1.345

Web of Science (2007): Indexed yes  
Scopus rating (2006): SJR 1.026 SNIP 1.35  
Web of Science (2006): Indexed yes  
Scopus rating (2005): SJR 0.723 SNIP 1.156  
Web of Science (2005): Indexed yes  
Scopus rating (2004): SJR 1.047 SNIP 1.323  
Web of Science (2004): Indexed yes  
Scopus rating (2003): SJR 0.44 SNIP 0.912  
Scopus rating (2002): SJR 1.134 SNIP 1.126  
Scopus rating (2001): SJR 1.024 SNIP 0.99  
Web of Science (2001): Indexed yes  
Scopus rating (2000): SJR 0.727 SNIP 0.957  
Web of Science (2000): Indexed yes  
Scopus rating (1999): SJR 0.853 SNIP 1.004

Original language: English

Micromechanics, Synchrotron x-ray diffraction, Ductile iron, Anisotropic elasticity, Residual stresses, Graphite nodules

Electronic versions:

Revised\_manuscript.pdf. Embargo ended: 07/06/2017

DOIs:

10.1088/0965-0393/24/5/055012

Source: FindIt

Source-ID: 277692656

Publication: Research - peer-review › Journal article – Annual report year: 2016