Diamond and cBN hybrid and nanomodified cutting tools with enhanced performance: Development, testing and modelling - DTU Orbit (08/09/2017)

The potential of enhancement of superhard steel and cast iron cutting tool performance on the basis of microstructural modifications of the tool materials is studied. Hybrid machining tools with mixed diamond and cBN grains, as well as machining tool with composite nanomodified metallic binder are developed, and tested experimentally and numerically. It is demonstrated that both combination of diamond and cBN (hybrid structure) and nanomodification of metallic binder (with hexagonal boron nitride/hBN platelets) lead to sufficient improvement of the cast iron machining performance. The superhard tools with 25% of diamond replaced by cBN grains demonstrate 20% increased performance as compared with pure diamond machining tools, and more than two times higher performance as compared with pure cBN tools. Further, cast iron machining efficiency of the wheels modified by hBN particles was 80% more efficient compared to the tool with the original binder. Computational model of hybrid superhard tools is developed, and applied to the analysis of structure-performance relationships of the tools.

General information
State: Published
Organisations: Department of Wind Energy, Composites and Materials Mechanics, National University of Science and Technology MISIS
Authors: Loginov, P. (Ekstern), Mishnaevsky, L. (Intern), Levashov, E. (Ekstern), Petrzhik, M. (Ekstern)
Number of pages: 10
Pages: 310-319
Publication date: 2015
Main Research Area: Technical/natural sciences

Publication information
Journal: Materials & Design
Volume: 88
ISSN (Print): 0264-1275
Ratings:
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.9 SJR 1.751 SNIP 2.481
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.885 SNIP 2.654 CiteScore 4.51
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 2.418 SNIP 3.474 CiteScore 4.36
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 2.045 SNIP 3.269 CiteScore 3.8
ISI indexed (2013): ISI indexed no
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.988 SNIP 3.212 CiteScore 3.31
ISI indexed (2012): ISI indexed no
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.406 SNIP 2.521 CiteScore 2.63
ISI indexed (2011): ISI indexed no
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.07 SNIP 1.822
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.93 SNIP 1.81
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.973 SNIP 1.361