



Document details

< Back to results | 1 of 1

[↗ Export](#)
[⬇ Download](#)
[🖨 Print](#)
[✉ E-mail](#)
[📄 Save to PDF](#)
[★ Add to List](#)
[More... >](#)
[Full Text](#) View at Publisher

Wear

Volume 438-439, 15 November 2019, Article number 203040

Effects of DLC /TiAlN-coated die on friction and wear in sheet-metal forming under dry and oil-lubricated conditions: Experimental and numerical studies (Article)

Sulaiman, M.H.^a ✉, Farahana, R.N.^a, Bienk, K.^b, Nielsen, C.V.^c, Bay, N.^c ^aSchool of Mechatronic Engineering, Universiti Malaysia Perlis, Arau, Perlis, 02600, Malaysia^bCemeCon Scandinavia A/S, Navervej 28, Hinnerup, 8382, Denmark^cDepartment of Mechanical Engineering, Technical University of Denmark, Kongens Lyngby, 2800, Denmark

Abstract

[View references \(44\)](#)

Experimental and numerical analyses were conducted to explore the influence of DLC/TiAlN-coated die surfaces in sheet-metal forming under dry and oil-lubricated conditions. In this study, ironing and deep-drawing experiments were performed to determine the potential of the DLC/TiAlN coating in the sheet forming of stainless steels under different tribological conditions. The performance and physical properties of the DLC/TiAlN-coated die surface were obtained through load, surface roughness, and wear measurements as well as hardness and microstructure examination. The experimental results indicated that the DLC/TiAlN coating strongly resists galling under dry friction and thin film lubrication conditions that reduces the friction and forming load. The presence of a thin oil film reduces the sliding-originated surface tensile stresses of the DLC/TiAlN coating, improving the wear resistance of the die surface even at high temperatures and high contact pressures. Thermomechanical numerical analysis supported the experimental results, which confirmed that the lubricant discharged the heat generated in the die–workpiece contact region to reduce the friction and forming load. With the DLC/TiAlN coating, the plain mineral oil with no extreme pressure additives can function as effective as chlorinated paraffin oil for protecting the die surface, thus extending the die service life. © 2019 Elsevier B.V.

SciVal Topic Prominence ⓘ

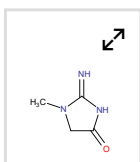
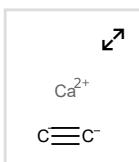
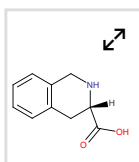
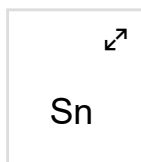
Topic: Ion Plating | Hard Coatings | Physical Vapor Deposition

Prominence percentile: 99.468



Chemistry database information ⓘ

Substances

Metrics ⓘ [View all metrics >](#)

6 Citations in Scopus

78th percentile

1.37 Field-Weighted
Citation Impact

PlumX Metrics

Usage, Captures, Mentions,
Social Media and Citations
beyond Scopus.

Cited by 6 documents

The Tribological Behavior of the
DLC-Coated Engine Surfaces
Lubricated with Oils with
NanoadditivesJozwiak, P. , Siczek, K. , Batory, D.
(2020) *SAE Technical Papers*Determination of friction
coefficient in the lubricated ring
upsetting with palm kernel oil for
cold forging of aluminum alloysYahaya, A. , Samion, S. , Musa,
M.N.
(2020) *Jurnal Tribologi*Recent developments and trends
in sheet metal formingTrzepieciński, T.
(2020) *Metals*[View all 6 citing documents](#)Inform me when this document
is cited in Scopus:
[Set citation alert >](#)

Related documents

Author keywords

Carbon-based coatings Gallings Other manufacturing processes Sliding friction Sliding wear Steel

Indexed keywords

Engineering controlled terms: Additives Coatings Dies Friction Lubrication Metal drawing Numerical analysis Paraffin oils Petroleum additives Steel Surface roughness Wear of materials Wear resistance

Engineering uncontrolled terms Carbon based coatings Gallings Manufacturing process Sliding friction Sliding wear

Engineering main heading: Sheet metal

Funding details

Funding sponsor	Funding number	Acronym
Universiti Malaysia Perlis		
Taiho Kogyo Tribology Research Foundation See opportunities by TTRF↗	9009-00059,9008–00015	TTRF
Natur og Univers, Det Frie Forskningsråd	DFF—4005-00130	FNU, DFF
Danmarks Tekniske Universitet		DTU
Delhi Technological University		DTU

Funding text

This work was financially supported by the Danish Council for Independent Research [grant number DFF—4005-00130], the Taiho Kogyo Tribology Research Foundation Japan [grant number 9008–00015] and the Short-term Grant UniMAP [grant number 9009-00059]. The authors gratefully acknowledge support from the Universiti Malaysia Perlis (UniMAP) and the Technical University of Denmark (DTU).

ISSN: 00431648
CODEN: WEARA
Source Type: Journal
Original language: English

DOI: 10.1016/j.wear.2019.203040
Document Type: Article
Publisher: Elsevier Ltd

Improved interfacial adhesion between TiAlN/DLC multi-layered coatings by controlling the morphology via bias

Liu, L. , Wu, Z. , An, X.
(2017) *Surface and Coatings Technology*

The wettability characteristics of DLC coating for tribological engineering applications

Sulaiman, M.H. , Farahana, R.N. , Tajul, L.
(2019) *IOP Conference Series: Materials Science and Engineering*

Corrosion resistance of PVD hard coatings for tribological engineering applications

Sulaiman, M.H. , Sheng, A.O.C. , Farahana, R.N.
(2019) *IOP Conference Series: Materials Science and Engineering*




View all related documents based on references

Find more related documents in Scopus based on:

Authors > Keywords >

References (44)

View in search results format >

☐ All | Export  Print  E-mail  Save to PDF Create bibliography