

Accepted Manuscript

Annealing effect on the fracture toughness of CrN/TiN superlattices

R. Hahn, M. Bartosik, M. Arndt, P. Polcik, P.H. Mayrhofer



PII: S0263-4368(17)30729-1
DOI: doi:[10.1016/j.ijrmhm.2017.11.008](https://doi.org/10.1016/j.ijrmhm.2017.11.008)
Reference: RMHM 4560

To appear in: *International Journal of Refractory Metals and Hard Materials*

Received date: 9 October 2017
Accepted date: 7 November 2017

Please cite this article as: R. Hahn, M. Bartosik, M. Arndt, P. Polcik, P.H. Mayrhofer , Annealing effect on the fracture toughness of CrN/TiN superlattices. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Rmhm(2017), doi:[10.1016/j.ijrmhm.2017.11.008](https://doi.org/10.1016/j.ijrmhm.2017.11.008)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Annealing effect on the fracture toughness of CrN/TiN superlattices

R. Hahn^{1,2}, M. Bartosik^{1,2}, M. Arndt³, P. Polcik⁴, P.H. Mayrhofer^{1,2}

¹ Institute of Materials Science and Technology, TU Wien, 1060 Vienna, Austria

² Christian Doppler Laboratory for Application Oriented Coating Development at the Institute of Materials Science and Technology, TU Wien, 1060 Vienna, Austria

³ Oerlikon Balzers, Oerlikon Surface Solutions AG, Liechtenstein

⁴ Plansee Composite Materials GmbH, Lechbruck am See, Germany

Abstract

Superlattice films are generally known for their exceptional high hardness compared to their monolithic constituents. Recently, we have shown that CrN/TiN superlattice films exhibit a peak in fracture toughness for a bilayer period of 6.0 nm, similar to the former reported peak in hardness. We propose that a dominating factor for obtaining such favourable material properties is the interface constitution between the individual layers.

To proof this notion, we have intentionally modified the interface sharpness by post-deposition vacuum annealing of the samples at different temperatures. This promotes interdiffusion of Ti or Cr into its adjacent layers and gradually changes the interfaces to interphases (because TiN and CrN form a solid solution). In order to obtain reliable K_{IC} fracture toughness values as a function of the annealing temperature, in-situ micromechanical cantilever bending tests on *ex-situ* vacuum annealed freestanding films were performed. High temperature loads take also place during machining processes like dry cutting or high-speed cutting, and are thus of high practical relevance.

Keywords

Hard coatings, Superlattice, Fracture toughness, Micromechanical testing, Annealing effect

Download English Version:

<https://daneshyari.com/en/article/7989877>

Download Persian Version:

<https://daneshyari.com/article/7989877>

[Daneshyari.com](https://daneshyari.com)