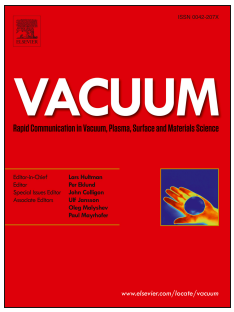
Accepted Manuscript



Characterization of spherical indenter with fused silica under small deformation by Hertzian relation and Oliver and Pharr's method

Chenghui Gao, Ming Liu

PII: S0042-207X(17)31912-7

DOI: 10.1016/j.vacuum.2018.03.061

Reference: VAC 7904

To appear in: *Vacuum*

Received Date: 22 December 2017

Revised Date: 30 March 2018

Accepted Date: 31 March 2018

Please cite this article as: Gao C, Liu M, Characterization of spherical indenter with fused silica under small deformation by Hertzian relation and Oliver and Pharr's method, *Vacuum* (2018), doi: 10.1016/j.vacuum.2018.03.061.

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.

ACCEPTED MANUSCRIPT

Characterization of spherical indenter with fused silica under small deformation by Hertzian relation and Oliver and Pharr's method

Chenghui Gao and Ming Liu*

School of Mechanical Engineering and Automation, Fuzhou University, 350116 Fuzhou, P. R. China

Corresponding author: mingliu@fzu.edu.cn +86 15606066237 (M. Liu)

Abstract

Radius and area function of a spherical indenter are calibrated by performing spherical nanoindentation tests on fused silica with known properties. The spherical indenter is made of ruby with a relatively large radius of 200 μm in nominal value. Hertzian relation was found to be successful in characterizing radius of spherical indenter under purely elastic deformation condition. Oliver and Pharr's method is dependent on the measurement accuracy of residual displacement, which cannot be measured within acceptable precision under very little plastic deformation with values of residual displacement being only several nanometers. Area function calibrated with Oliver and Pharr's method on a brittle material like fused silica was found to be smaller than true value, leading to measured elastic modulus larger than true value. A softer material that can produce sufficient plastic deformation with large residual displacement is recommended as the standard material for area function calibration.

Keywords: Characterization; Nanoindentation; Spherical indenter; Indenter Radius; Small deformation

Download English Version:

https://daneshyari.com/en/article/8044252

Download Persian Version:

https://daneshyari.com/article/8044252

Daneshyari.com