

# Accepted Manuscript

Full Length Article

Oxygen bonding configurations and defects on differently oxidized diamond surfaces studied by high resolution electron energy loss spectroscopy and X-ray photoelectron spectroscopy measurements

F.N. Li, R. Akhvlediani, M.K. Kuntumalla, A. Hoffman

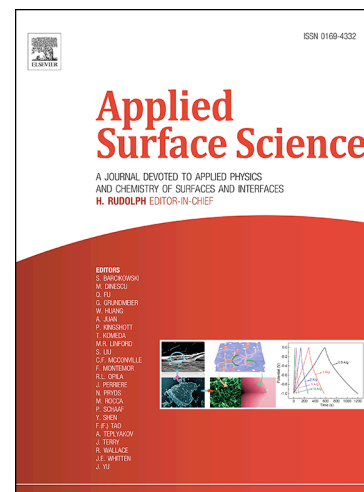
PII: S0169-4332(18)32596-0  
DOI: <https://doi.org/10.1016/j.apsusc.2018.09.171>  
Reference: APSUSC 40475

To appear in: *Applied Surface Science*

Received Date: 28 August 2018  
Revised Date: 20 September 2018  
Accepted Date: 21 September 2018

Please cite this article as: F.N. Li, R. Akhvlediani, M.K. Kuntumalla, A. Hoffman, Oxygen bonding configurations and defects on differently oxidized diamond surfaces studied by high resolution electron energy loss spectroscopy and X-ray photoelectron spectroscopy measurements, *Applied Surface Science* (2018), doi: <https://doi.org/10.1016/j.apsusc.2018.09.171>

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.



**Oxygen bonding configurations and defects on differently oxidized diamond surfaces studied by high resolution electron energy loss spectroscopy and X-ray photoelectron spectroscopy measurements**

F.N. Li<sup>\*</sup>, R. Akhvlediani, M.K. Kuntumalla, A. Hoffman<sup>\*</sup>

*Schulich Faculty of Chemistry, Technion-Israel Institute of Technology, Haifa 32000, Israel*

**Abstract**

In this work, the interaction of oxygen with polycrystalline diamond film surface exposed to vacuum ultraviolet ozone (UVO), chemical acid and oxygen plasma treatments was investigated. The surfaces were characterized by high resolution electron energy loss spectroscopy (HREELS) and X-ray photoelectron spectroscopy measurements (XPS). HREELS results showed that the diamond surfaces were reconstructed by forming C=C, =CH<sub>x</sub>, ≡CH or C-H(*def*) bonds, upon the conversion to oxygen-terminated diamond (O-diamond). The plasma O-diamond had the highest level of surface reconstruction and defects, followed by the UVO and acid diamond. The coverage of oxygen for the UVO, acid and plasma O-diamond was calculated to be 0.86, 0.58 and 0.90 monolayer, respectively. The fractions of oxygen containing components such as C-O-C, C-O-O-C, C=O and -COH were also compared for the O-diamond surfaces. These components were carefully assigned in the XPS spectra by comparing the HREELS results. Furthermore, surface band bending was discussed by analyzing the binding energy shift of the *sp*<sup>3</sup> C-C components. In the end, thermal stability of surface bonding configurations were investigated by annealing the diamond film in ultrahigh vacuum chamber at high temperatures.

**Keywords:** Diamond; HREELS; XPS; surface reconstruction; oxygen termination.

<sup>\*</sup>Corresponding author.

*E-mail address:* lifengnan@technion.ac.il; choffman@technion.ac.il

Download English Version:

<https://daneshyari.com/en/article/11026966>

Download Persian Version:

<https://daneshyari.com/article/11026966>

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