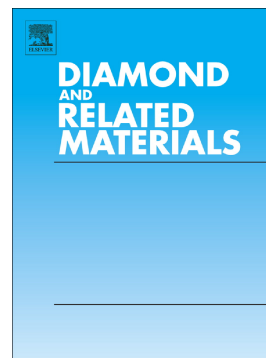


Accepted Manuscript

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PII: S0925-9635(17)30135-8
DOI: doi: [10.1016/j.diamond.2017.04.012](https://doi.org/10.1016/j.diamond.2017.04.012)
Reference: DIAMAT 6864
To appear in: *Diamond & Related Materials*
Received date: 21 March 2017
Revised date: 9 April 2017
Accepted date: 10 April 2017

Please cite this article as: T. Wade, M.W. Geis, T.H. Fedynyshyn, S.A. Vitale, J.O. Varghese, D.M. Lennon, T.A. Grotjohn, R.J. Nemanich, M.A. Hollis, Effect of surface roughness and H-termination chemistry on diamond's semiconducting surface conductance. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Diamat(2017), doi: [10.1016/j.diamond.2017.04.012](https://doi.org/10.1016/j.diamond.2017.04.012)

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Effect of Surface Roughness and H –Termination Chemistry on Diamond's Semiconducting Surface Conductance

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Keywords: Diamond, Hydrogen-termination, Molecular adsorption, Hole channel

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Abstract

The H-terminated surface of diamond when activated with NO₂ produces a surface conduction layer that has been used to make FETs. Variations in processing can significantly affect this conduction layer. This article discusses the effect of diamond surface preparation and H termination procedures on surface conduction. Surface preparations that generate a rough surface result in a more conductive surface with the conductivity increasing with surface roughness. We hypothesize that the increase in conductance with roughness is the result of an increase of reactive sites that generate the carriers. Roughening the diamond surface is just one way to generate these sites and the rough surface is believed to be a separate property from the density of surface reactive sites. The presence of C in the H₂ plasma used for H termination decreases surface conductance. A simple procedure for NO₂ activation is demonstrated. Interpretation of electrical measurements and possible alternatives to activation with NO₂ are discussed. Using Kasu's oxidation model for surface conductance as a guide, compounds other than NO₂ have been found to activate the diamond surface as well.

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