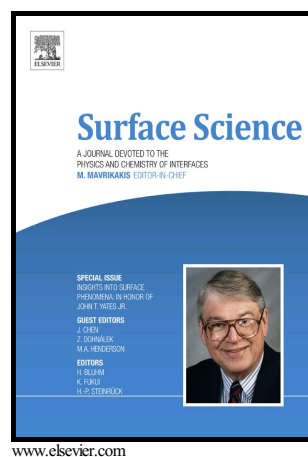


Author's Accepted Manuscript

Study of Thermal-Field Emission Properties and Investigation of Temperature dependent Noise in the Emission Current form vertical Carbon nanotube emitters

Sadhu Kolekar, S.P. Patole, Sumati Patil, J.B. Yoo, C.V. Dharmadhikari



PII: S0039-6028(16)30797-X
DOI: <http://dx.doi.org/10.1016/j.susc.2017.05.002>
Reference: SUSC21025

To appear in: *Surface Science*

Received date: 26 December 2016
Revised date: 6 April 2017
Accepted date: 4 May 2017

Cite this article as: Sadhu Kolekar, S.P. Patole, Sumati Patil, J.B. Yoo and C.V. Dharmadhikari, Study of Thermal-Field Emission Properties and Investigation of Temperature dependent Noise in the Emission Current form vertical Carbon nanotube emitters, *Surface Science*, <http://dx.doi.org/10.1016/j.susc.2017.05.002>

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 galley proof before it is published in its final citable 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.

Study of Thermal-Field Emission Properties and Investigation of Temperature dependent Noise in the Emission Current form vertical Carbon nanotube emitters

Sadhu Kolekar^{a,b,1}, S. P. Patole^{c,2}, Sumati Patil^{a,3}, J. B. Yoo^c, C. V. Dharmadhikari^{a,4}

^aDepartment of Physics, Savitribai Phule Pune University, Pune 411007, India.

^bCatalysis Division, CSIR- National Chemical Laboratory, Pune 411008, India.

^cSchool of Advanced Materials Science and Engineering, Sungkyunkwan University, Suwon 440 746, Korea.

skolekar@usf.edu

cvd@physics.unipune.ernet.ac.in

**Corresponding author:*

Abstract

We have investigated temperature dependent field electron emission characteristics of vertical carbon nanotubes (CNTs). The generalized expression for electron emission from well defined cathode surface is given by Millikan and Lauritsen [1] for the combination of temperature and electric field effect. The same expression has been used to explain the electron emission characteristics from vertical CNT emitters. Furthermore, this has been applied to explain the electron emission for different temperatures ranging from room temperature to 1500 K. The real-time field electron emission images at room temperature and 1500 K are recorded by using Charge Coupled Device (CCD), in order to understand the effect of temperature on electron emission spots in image morphology (as indicated by ring like structures) and electron emission spot intensity of the emitters. Moreover, the field electron emission images can be used to calculate the total number of emitters per cm^2 for electron emission. The calculated number of emitters per cm^2 is 4.5×10^7 and, the actual number emitters per cm^2 present for electron emission calculated from Atomic Force Microscopy (AFM) data is 1.2×10^{12} . The measured Current-Voltage (I-V) characteristics obey the Folwer-Nordheim (F-N) type behavior. The fluctuations in the emission current are recorded at different temperatures and, temperature dependence of power spectral density obeys power law relation $s(f) = I^2/f^2$ with that of emission current and frequency.

¹ Presently at Department of Physics, University of South Florida, Tampa, Florida, USA 33620-995.

² Presently at Department of Materials Science and Engineering, King Abdullah University of Science and Technology, Thuwal 23955-6900 Saudi Arabia.

³ Presently at Indian Institute of Science, Bangalore- 560012, India.

⁴ Presently at Indian Institute of Science, Education & Research, Pashan, Pune-411008, India.

Download English Version:

<https://daneshyari.com/en/article/5421114>

Download Persian Version:

<https://daneshyari.com/article/5421114>

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