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## Field Emission Characteristics of Regular Arrays of Carbon Nanotubes

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### JOURNAL OF NANOSCIENCE AND NANOTECHNOLOGY

Volume: 14 Issue: 6 Pages: 4714-4717

DOI: 10.1166/jnn.2014.8279

Published: JUN 2014

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### Abstract

The developments of electronic devices based on micron-sized vacuum electron sources during the last decades have triggered intense research on highly efficient carbon based thin film electron emitters. The synthesis of massive arrays of carbon nanotubes that are oriented on patterned Fe catalyst deposited on quartz substrates is reported. The well-ordered nanotubes can be used as electron field emission arrays. Scaling up of the synthesis process should be entirely compatible with the existing semiconductor processes, and should allow the development of nanotubes devices integrated into future technology. The emission from carbon nanotubes array is explained by Fowler-Nordheim tunneling of electrons from tip-like structures in the nanometer range, which locally amplify the applied field by the field enhancement factor beta. We found that the low pressure chemical vapour deposition (LPCVD) system can produce nanotubes capable of excellent emission currents at lower voltages. The carbon nanotubes array shows good field emission with turn on field E-alpha = 1.30 V/mu m at the current density of 3.50 mA/cm(2) with enhancement factor beta = 1.22 x 10(2).

### Keywords

**Author Keywords:** Chemical Synthesis; Raman Spectroscopy; Field Emission; Carbon Nanotubes

**KeyWords Plus:** FABRICATION; DISPLAYS; FILMS

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### Funding

Funding Agency	Grant Number
Deanship of Scientific Research (DSR), King Abdulaziz University, Strategic unit, Saudi Arabia	8-NAN185-3

[View funding text](#)

### Publisher

AMER SCIENTIFIC PUBLISHERS, 26650 THE OLD RD, STE 208, VALENCIA, CA 91381-0751 USA

### Categories / Classification

**Research Areas:** Chemistry; Science & Technology - Other Topics; Materials Science; Physics

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### Document Information

**Document Type:** Article

**Language:** English

**Accession Number:** WOS:000332339500109

**PubMed ID:** 24738452

**ISSN:** 1533-4880

**eISSN:** 1533-4899

### Journal Information

**Table of Contents:** [Current Contents Connect](#)

**Impact Factor:** [Journal Citation Reports](#)

### Other Information

**IDS Number:** AC2NY

**Cited References in Web of Science Core Collection:** **24**

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