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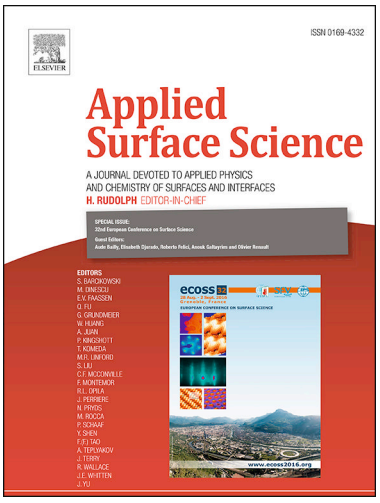

Full Length Article

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Fabrication of Carbon Nanotube on Nickel–Chromium Alloy Wire for High-Current Field Emission

Xiao-lu Yan[1], Yu-long Wu[1], Bao-shun Wang[1], Quan Zhang[1], Rui-ting Zheng[1], Xiao-ling Wu[1], Guo-an Cheng[1]*

[1] Laboratory of Nanomaterial and Technology, College of Nuclear Science and Technology, Beijing Normal University, Beijing 100875, China

* Correspondence: gacheng@bnu.edu.cn; Tel.: +86-010-6220-5403

Abstract: The application of field emission (FE) devices requires emitters having a low threshold field (E_{th}, applied field at 10 mA/cm^2) and an excellent FE stability at a high emission current density. Herein, we report on the fabrication and field emission characteristics of a carbon nanotube (CNT) emitter formed as a CNT film grown directly on nickel–chromium (Ni80Cr20) alloy wire using microwave plasma enhanced chemical vapour deposition (PECVD). The FE performance of the emitter has a low threshold field of 0.76 V/μm, a large field enhancement factor (8311.3 ± 53.1) and an extremely large emission current density (J_{max}) of 7.65 A/cm^2 at a relatively low electric field of 2.13 V/μm. The great increase in J_{max} is ascribed to the reinforced adhesion of CNTs to the Ni80Cr20 alloy wire substrates. The direct synthesis of CNTs on the nickel–chromium wire substrate without any catalyst layers and the wrapping of the CNT roots with a carbon nanoflake layer deposited on the surface of the wire substrate are responsible for the enhanced adhesion. The tip-type CNT emitter presents an