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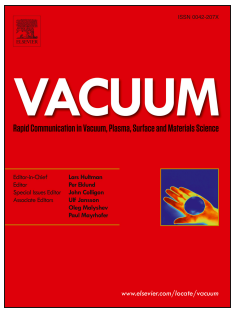

Synthesis and field electron emission properties of multi-walled carbon nanotubes films directly grown on catalytic stainless steel substrate

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Synthesis and field electron emission properties of multi-walled carbon nanotubes films directly grown on catalytic stainless steel substrate

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Abstract: The multi-walled CNTs films were directly grown on stainless steel substrates using an oxidation-reduction treatment with CVD. Microstructure and field emission properties of the as-received CNTs films were detailedly investigated. The results indicate that the CNTs have originally random orientation with relative high density, good crystalline perfection and large diameter. Besides, the CNTs films exhibit superior field electron emission performances with low threshold electric field (~4.2 V/μm) and very high emission current density (~24 mA/cm^2). Importantly, the CNTs directly grown on stainless steel substrates have remarkable long-term stability with ~3.4% fluctuation over 50 h continuous measurement under high current density, ~10 mA/cm^2. The perfect graphitization, large field enhancement factor, low interface resistance, good adhesion and high thermal conductivity are believed to be principally responsible for their superior field emission properties, which make them very promising application as an electron source in microthrust space electric propulsion neutralizer.

Keywords: CNT; field emission; oxidation-reduction; stainless steel substrate

Over the past two decades, as an ideal candidate for field electron emitter, carbon nanotube (CNT) has drawn considerable attentions due to its impressive electrical, chemical and mechanical properties and great potential applications in vacuum electronic devices [1-9], including ionization gauges [1-3, 8], x-ray tubes [4, 6, 9], neutralizer [7], and several others. In these applications, the CNTs are desired to grow

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