Effects of Nitric Acid and Chromic Acid Post-Treatments on the Surface Morphology and Field Emission Properties of Therm

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ABSTRACT

In this work, A simple acid treatment method was applied to functionalize the surface and to modify the structures of multi-walled carbon nanotubes (CNTs) grown on silicon substrates by thermal chemical vapor deposition (thermal CVD) using chromic acid(CrO3), nitric acid(HNO3) and a mixed solution of chromic trioxide and nitric acid Scanning electron microscopy (SEM), transmission electron microscopy (TEM), Raman spectroscopy, and energy dispersive spectrometer (EDS) were employed to investigate the mechanism causing the modified field emission (FE) properties of the CNT film. From our experimental data, it is found that after 20 min of CrO3+HNO3 treatment the emitted currents were enhanced by more than one order of magnitude compared with those of the untreated CNTs. We can see that after using a mixed solution of 20 min of CrO3+HNO3 treatment, the emission current density of CNTs reached 19.2mA/cm2,. and a lower turn-on electrical field than in the CNTs treated with HNO3 and CrO3. The method provides a simple, economical, and effective way to enhance the CNT field emission properties.

Keywords : carbon nanotubes (CNTs) ; emitted currents ; thermal chemical vapor deposition (thermal CVD)

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