

Catalyst Metal Pre-Treatments using Nitrogen-Based Gases and Their Effects on the Field Emission Properties of Thermal C

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ABSTRACT

In this work, Ni catalyst was annealed in N₂/NH₃/N₂O ambients in order to study their effects on the surface morphology and field emission characteristics of the synthesized carbon nanotubes (CNTs). CNTs were prepared with Ni catalyst under three different thermal annealing pre-treatment conditions. Thermal chemical vapor deposition system was employed to synthesize carbon nanotubes. The morphologies of carbon nanotube film were characterized by scanning electron microscopy and Raman respectively. Electron dispersive spectrometer (EDS) was used for the identification and analysis of the chemical composition of the surface of CNTs. In conclusion, the N₂O pre-treatment is proved to be an effective method to improve the surface morphology and field emission characteristics of the synthesized CNTs and a N₂O flow rate around 200sccm is the optimum value for the pre-treatment. CNTs synthesized with Ni pre-treated with N₂O have a highest surface density. In addition, Ni pre-treated with N₂O can inhibit or suppress the growth of amorphous carbon and exhibit highest emission current This improvement is accomplished through the more uniformly distributed and smaller catalyst Ni particles after N₂O pre-treatment.

Keywords : carbon nanotubes (CNTs) ; field emission ; thermal chemical vapor deposition (CVD)

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