B-4

Improving the Long-term Field Emission Stability of Carbon Nanotubes by Coating Co and Ni Oxide Layers

최주성, 이한성, 이내성†

세종대학교
(nslee@sejong.ac.kr†)

Some applications of carbon nanotubes (CNTs) as field emitters, such as x-ray tubes and microwave amplifiers, require high current emission from a small emitter area. To emit the high current density, CNT emitters should be optimally fabricated in terms of material properties and morphological aspects including high crystallinity, aspect ratio, distribution density, height uniformity, adhesion on a substrate, low outgassing rate during electron emission in vacuum, etc. In particular, adhesion of emitters on the substrate is one of the most important parameters to be secured for high current field emission from CNTs. So, we attempted a novel approach to improve the adhesion of CNT emitters by incorporating metal oxide layers between CNT emitters. In our previous study, CNT emitters were fabricated on a metal mesh by filtrating the aqueous suspensions containing both highly crystalline thin multiwalled CNTs and thick entangled multiwalled CNTs. However, the adhesion of CNT film was not enough to produce a high emission current for an extended period of time even after adopting the metal mesh as a fixing substrate of the CNT film. While a high current was emitted, some part of the film was shown to delaminate. In order to strengthen the CNT networks, cobalt-nickel oxides were incorporated into the film. After coating the oxide layer, the CNT tips seemed to be more strongly adhered on the CNT bush. Without the oxide layer, the field emission voltage-current curve moved fast to a high voltage side as increasing the number of voltage sweeps. With the cobalt-nickel oxide incorporated, however, the curve does not move after the second voltage sweep. Such improvement of emission properties seemed to be attributed to stronger adhesion of the CNT film which was imparted by the cobalt-nickel oxide layer between CNT networks. Observed after field emission for an extended period of time, the CNT film with the oxide layer showed less damage on the surface caused by high current emission.

Keywords: Carbon nanotubes, Mesh, Field emission, Cobalt and nickel oxides, Long-term stability

B-5

Evolutional Transformations of Copper Nanoparticles to Copper Oxide Nanowires

강민규[1,2], 윤호규[1], 김영석[2,†]

[1]고려대학교 신소재공학과, [2]전자부품연구원 디스플레이 부품소재 센터
(vis4freedom@keti.re.kr†)

We study and analyze here a novel and simple approach to produce copper oxide nanowires in a methanol as an alternative to chemical synthesis routs and VLS-growth method. First, copper oxide nanowires are grown from copper nanoparticles in methanol at 60°C. Nanoparticles are synthesized via inert gas condensation, one of the dry processes. Synthesized nanowires were confirmed via XRD, FESEM and TEM. As a result, all particles have grown to Cu2O nanowires (20～30 nm in diameter, 5～10 um in length; aspect ratio ＞160～500). Next, these synthesized oxide nanowires are reduced copper nanowires in the furnace under hydrogen flow at 200～450°C. The evolution of oxide nanowires and their transformation to copper nanowires is studied as a function of time.

Keywords: Nanowires, Copper, Copper oxide