Proc. 5th Int. Joint Symp. on Microelec. and Packaging,
IMAPS-Korea and IEEE-CPMT, Seoul, Korea, 2000.

Low temperature growth of carbon nanotube by plasma enhanced chemical vapor deposition (PECVD) using nickel catalyst

Kyoungmin Ryu, Mihyun Kang, Yangdo Kim and Hyeongtag Jeon

Division of Materials Science and Engineering, Hanyang University, Seoul 133-791, Korea

Recently, carbon nanotube has been investigating for field emission display (FED) applications due to its high electron emission at relatively low electric field. However, the growing of carbon nanotube generally requires relatively high temperature processing such as arc-discharge (5,000 ~ 20,000 °C) and laser evaporation (4,000 ~ 5,000 °C) methods. In this presentation, low temperature growing of carbon nanotube by plasma enhanced chemical vapor deposition (PECVD) using nickel catalyst which is compatible to conventional FED processing temperature will be described. Carbon notubes with average length of 100 nm and diameter of 2 ~ 3 μm were successfully grown on silicon substrate with native oxide layer at 550 °C using nickel catalyst. The morphology and microstructure of carbon nanotube was highly depended on the processing temperature and nickel layer thickness. No significant carbon nanotube growing was observed with samples deposited on silicon substrates without native oxide layer. This is believed due to the formation of nickel-silicide and this deteriorated the catalytic role of nickel. The formation of nickel-silicide was confirmed by x-ray analysis. The role of native oxide layer and processing parameter dependence on microstructure of low temperature grown carbon nanotube, characterized by SEM, TEM XRD and Raman spectroscopy, will be presented.