Highly conductive and thermally stable doped MWCNTs synthesized by arc discharge and their superior field emission properties

Syed Muhammad Zain Mehdi and Naesung Lee*

HMC, Department of Nanotechnology and Advanced Materials Engineering, Sejong University,

209 Neungdong-ro, Gwanjin-gu, Seoul 05006, Korea

*Corresponding author: nslee@sejong.ac.kr

Multiwalled carbon nanotubes (MWCNTs) doped with heteroatoms are promising materials for several electronic applications. This work synthesized the doped MWCNTs using an electric arc discharge technique and studied their electrical and field emission properties. Owing to their improved electrical properties such as work function, carrier concentration and electrical conductivity, the doped MWCNT emitters show improved field emission characteristics. Oxidation resistance of the doped MWCNTs is enhanced up to 13% as well, probably causing a higher emission current and a longer emission stability. Aspect ratios of MWCNTs, which are length-to-diameter ratios, are increased by doping MWCNTs, affecting the field enhancement factors of CNT emitters. These highly conductive and thermally stable doped CNTs seem to be promising as an excellent emitter material for cold emission guns which can be widely applied to x-ray tubes, UV-lamps, and other electron beam treatments.