Improvement of Electrical Conductivity of Transparent Conductive Single-Walled Carbon Nanotube Films Fabricated by Surfactant Dispersion

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Abstract : Single-walled carbon nanotubes (SWCNTs) have attracted much attention as promising materials for transparent conducting films (TCFs), thanks to their superior electrical conductivity, high mechanical strength, and complete flexibility. The CNT-based TCFs can be used in a variety of application fields as flexible, transparent electrodes, including touch panel screens, flexible electronics, transparent heaters, etc. First of all, this study investigated the effect of a variety of surfactants on the dispersion of SWCNTs in an aqueous solution. Following the optimization of the dispersion by surfactants, flexible TCFs were fabricated by spraying the CNT suspension onto poly(ethylene terephthalate) (PET) substrates. The sheet resistances of the TCFs having different surfactants were investigated with treatment in nitric acid (HNO_3) whose concentration and period of treatment time were varied. It seems that the HNO_3 removes the surfactants from and is simultaneously doped into the SWCNT network, reducing the contact resistance between CNTs. TCFs were characterized by UV-VIS spectroscopy, thermogravimetric analyzer (TGA), scanning electron microscopy (SEM), and four-point probe.

Key Words : Transparent conductive film, single-walled carbon nanotube, surfactant, nitric acid treatment, sheet resistance