

Surface electrical conductivity in ultrathin single-wall carbon nanotube/polymer nanocomposite films

Valery Bliznyuk, Srikanth Singamaneni, and Ramesh Kattumenu

Materials Science and Engineering, College of Engineering and Applied Sciences, Western Michigan University, Kalamazoo, Michigan 49008

Massood Atashbar

Electrical and Computer Engineering, College of Engineering and Applied Sciences, Western Michigan University, Kalamazoo, Michigan 49008

Abstract

Ultrathin composite films of single-wall carbon nanotubes dispersed in polymer matrices of polystyrene and polyurethane elastomers with the thickness ranging from 100 nm to 3 μm were formed by dip-coating procedure. Electrical conductivity in plane of the film was measured with application of silver electrodes deposited through shadow mask techniques at polymer-air and polymer-substrate interfaces. Peculiarities of the surface electrical conductivity in the nanocomposite films have been related to the surface free energy of the components and the strength of polymer-substrate interfacial interaction, which promotes a nonuniform distribution of the conductive filler within the film thickness (vertical phase separation). © 2006 American Institute of Physics.