

Bending actuation and charge distribution behavior of polyurethane/carbon nanotube electroactive nanocomposites

Abstract

The electroactive nanocomposite films were fabricated using polyurethane (PU) with modified carbon nanotubes (CNTs) as the filler. The CNTs were modified using microwave-induced polymerization route and they were found to be highly dispersed in polar solvents such as dimethylformamide. The modified CNTs were characterized using transmission electron microscopy, field emission scanning electron microscopy, thermogravimetric analysis, and X-ray photoelectron spectroscopy. To evaluate these films we mainly focused on electrical properties such as actuation behavior, resistivity, impedance analysis, and space charge measurements. We found that the PU/CNT films bent toward the cathode when an electric field was applied and they reverted to its original position when the electric field was removed. Upon the incorporation of CNTs as the filler for the polymer, the electrical properties of the films improved significantly. Asymmetric charge accumulation was observed from space charge measurements in some of the films and this explains the bending deformation and the actuation behavior.