Carbon nanotube-based stretchable composite materials for electronic devices and applications

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Single wall carbon nanotube (SWCNT) based conductors, self-grafted on different polymer films, are assembled aiming to develop a simple technology for flexible and stretchable electronic devices [1]. Contrary to what commonly reported for carbon nanotubes (CNT), no chemical functionalization of SWCNT is necessary for stable grafting onto several polymeric surfaces [2, 3]. Here, electrical characterization of both unstretched and strongly stretched conductors is provided.
An insight of the mechanisms of strong adhesion to the polymer is obtained by scanning electron microscopy of the surface composite and by a strip-off test. The demonstration of one technological application of such stretchable circuitry is provided, whereby the electrical functionality of a carbon nanotube-based six-sensor (electrode) grid is used to record subdural electrocorticograms in freely-moving laboratory rats over approximately three months [4]. Different device geometries and interactions with different polymers substrate are investigated aiming at a variety of application.

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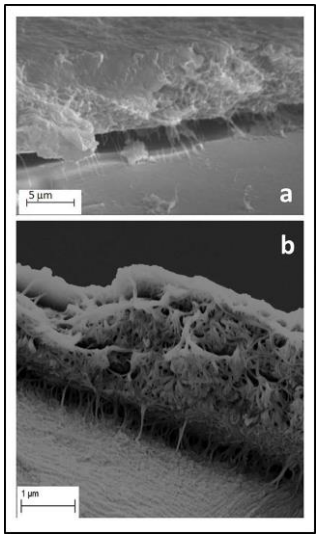

Figure 1. SEM images of SWCNT layers on MD-PE at different angles a) shows strained nanotubes on attempting detachment of the SWCNT layer from the polymer; b shows the large amount of binding nanotubes well rooted into the polymer.

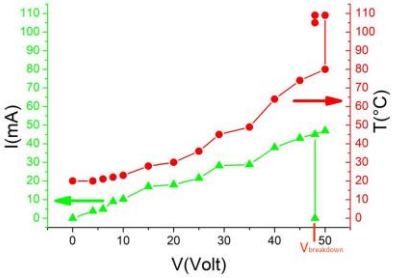

Figure 2. Characterization of wire composite SWCNT/ PE behavior at increasing voltage applied to the breakdown voltage.