Inovative Polymer/Nanographite composites for sensor applications

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In this paper we are going to report our recent achievements in development of innovative polymer/nanographite composites (PNC) for application mainly in mechanical and chemical sensors. With the term "nanographite" we label carbon materials that have a sp^2-hybridized crystal structure like graphite, and at least one dimension is smaller than 100 nm, for example: extra-conductive highly structured carbon black (EHSCB); carbon nanotubes (CNT); thermally exfoliated graphite (TEG) as well as recently discovered graphene. We have shown that the above mentioned composites can be sensitive to different outer influences like mechanical force or chemicals vapour, if the concentration of nanostructure filler is slightly above the value of percolation threshold [1]. If we choose appropriate polymer matrix it is possible to create PNC for humidity sensing, pressure sensing, organic solvent vapours sensing as well as for thermistors with positive or negative temperature resistivity coefficient. Using different carbon nanostructures (for example, highly structured carbon black, graphene or carbon nanotubes with different aspect ratio) or their combinations as a filler for defined polymer matrix, we can control sensitivity. The observed sensing effects are explained in terms of quantum physical charge tunneling and percolation theory. Some functioning

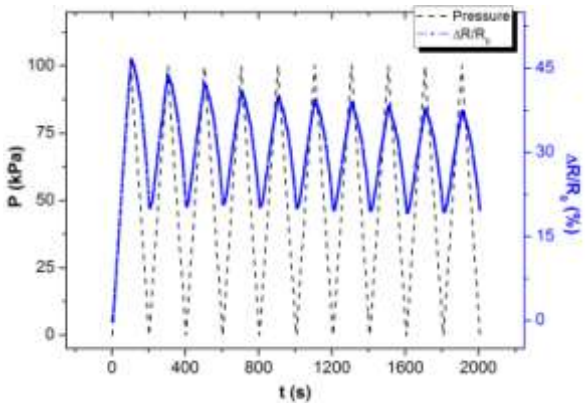

Fig.1 Piezoresistive sensitivity of hybrid Pi/CNT(8)/EHSCB(3) composite sample in cyclic test under 1 atmosphere amplitude of pressure

experimental transducers have been built and tested for detecting of mechanical vibrations (Fig.1) as well as for detecting of different chemical vapours.

References

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