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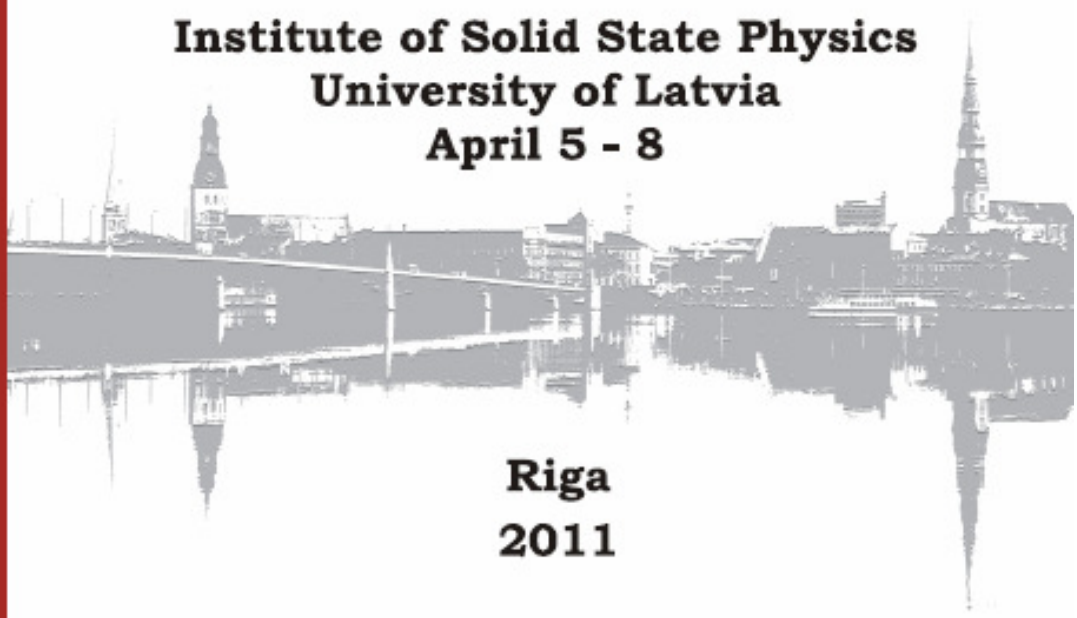

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Elaboration of Polymer/Nanostructured Carbon Composite for Humidity Sensor Application

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Humidity detection in the surrounding atmosphere is of great interest for industrial, scientific and environmental application. Our main goal is to create humidity sensor, which is small in dimensions, flexible and which is able to measure moisture inside different materials. Interaction of polyvinyl alcohol – high structure carbon black (PVA-CB) nanoparticle composite with water vapor has been investigated in this work. It was found that under influence of water vapour the electrical resistance of the composite changes and the change depends on exposition time. The humidity sensing effect of PVA-CB composite can be explained as fallows: water vapour induces composite matrix swelling, distance between carbon aggregates is increased and tunneling currents in thin layers of matrix are changed. Samples containing 9 w.% of nanostructured carbon black showed more stable initial resistance and were found to be more sensitive showing 33 % resistance change in 10 min. in humid environment (relative humidity 99%). The effect is reversible, necessary time for relaxation has been found to be equal to 60 min. Comparing results obtained from simultaneous measurements of the electrical resistance and the sample length with theory of charge tunneling in conductor-polymer composite, we can conclude that current tunneling exists in thin layers of PVA-CB composite among carbon nanoparticles (Fig.1). In our opinion, the existence of tunneling currents in the composite directly enhances the sensitivity of the composite to water vapour.

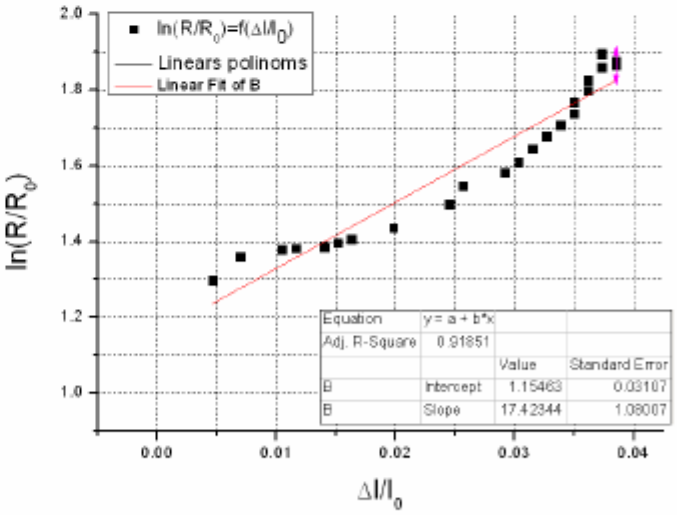

Fig. 1. The change of electrical resistance of PVA-CB9 composite versus relative elongation induced by composite swelling in water vapour.