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ABSTRACTS

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Attempts to Improve Polyvinylacetate-Nanostructured Carbon Composite Sensitivity to Ethanol Vapour

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It is progressive nowadays to look for "green" lifestyle. So first we need to think about air quality. A sensor material polyvinylacetate – nanostructured carbon composite (PVAc-NCC) was created to monitor the air quality in factories and laboratories. This material has got the ability to sense polar organic solvent vapour in short time (30s) by increase of electrical resistance. When the sensor material has been removed from ethanol vapour its electrical resistance relaxes fully to the initial electrical resistance value.

The PVAc-NCC percolation threshold has been determined at first. After was stated that composite shows the best sensitivity to ethanol vapour concentration (0,3ml/l) in the vicinity of percolation threshold, that is, at 3 p.h.r carbon black. When the composite was exposed to concentration 0,119ml/l, electrical resistance change of the composite was not noticed. So our next step is to improve the sensitivity of PVAc-NCC to lower ethanol vapour concentrations. For this reason plasticizers (polyethylene glycol with low molecular weight (300; 400; 1000; 6000)) have been used for more sensitive PVAc-NCC elaboration.

From the polymer glass transition theory is known that at temperatures well above glass transition temperature (T_g) molecules have a great deal of freedom to move. Chains are free to take up all the conformations allowed by rotations around single bonds [1]. We have noticed that addition of filler material significantly reduces the value of T_g. Data obtained from differential scanning calorimetry measurements indicate that T_g of pure PVAc is 39.07^0C and 3.28^0C for PVAc-NCC with 10 mass parts of carbon black. We are going to determine a change of T_g for the composite with varying filler content and evaluate it impact on vapour sensitivity. Also simultaneous mass and electrical resistance change measurements results for PVAc-NCC will be presented with a purpose to explain and improve PVAc-NCC sensitivity to ethanol vapour.

1. David I. Bower. An Introduction to Polymer Physics. Cambridge University Press, 2002, p. 209.