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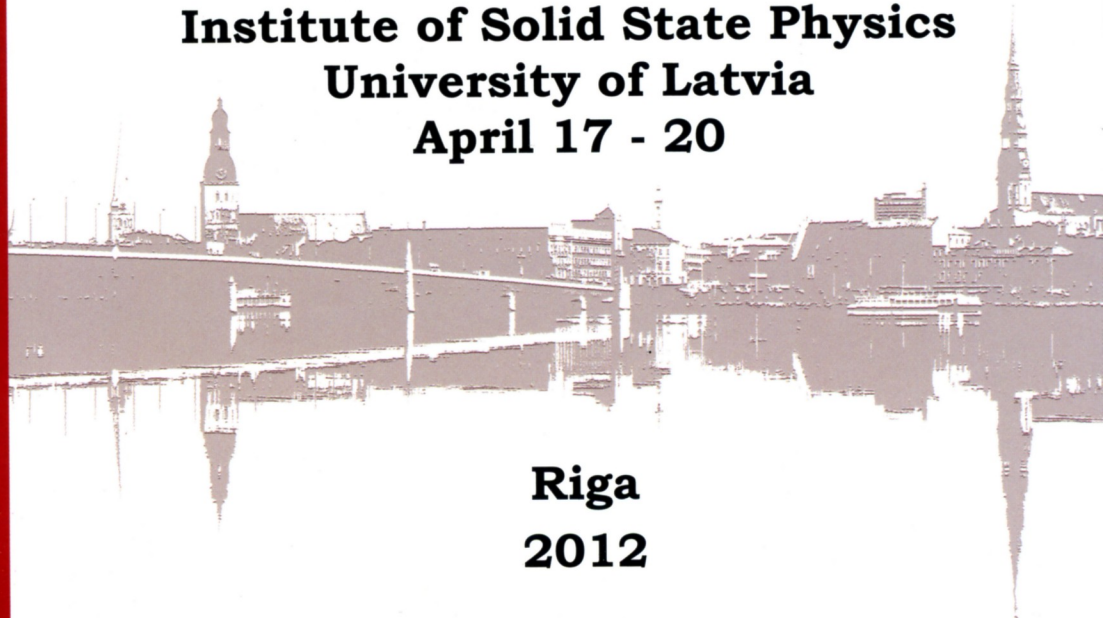

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Evaluation of Polymer-Nanostructured Carbon Composites Response to Chemical Stimuli

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Nowadays scientific progress and improving of chemical industry has made a big step forward. That means, the possibility of various organic solvents to come in tracheas of workers is growing and it can make irreversible damage to workers organism. Therefore there is a need to design, elaborate and investigate polymer-nanostructured carbon composite (P-NCC), which would serve in factories as a sensor material and would warn workers about health risks or it can help manufacturers control production processes.

Sensor material is made of polymer matrix (polyethylene glycol (PEG) and ethylene-vinyl acetate (EVA)) and conductive ingredient (high structured carbon black nanoparticles). Used polymer matrixes differ with structure and polarity. PEG is highly crystalline and polar polymer, while EVA has amorphous structure and is non-polar polymer. Specifically formed sensor material structure enables chemical vapour detection in the air.

PEG-NCC and EVA-NCC percolation thresholds are determined. PEG-NCC percolation curve shows unexpected behavior, instead of one percolation threshold we observed two thresholds at 3 and 8 mass parts of carbon black. EVA-NCC percolation threshold is around 7 mass parts of carbon black. Conclusion is that linear polymer macromolecules, like PEG have, promoted faster conductive channel formation between carbon black nanopartilces.

PEG-NCC and EVA-NCC chemical vapour sensitivity depending on concentration of carbon black have been evaluated. As expected both composites show the best ethanol vapour sensitivity slightly above percolation thresholds. PEG-NCC highest response is observed at 8 mass parts of carbon black. It can be explained with PEG crystalline structure reduction when increase the concentration of carbon black in the composite content.