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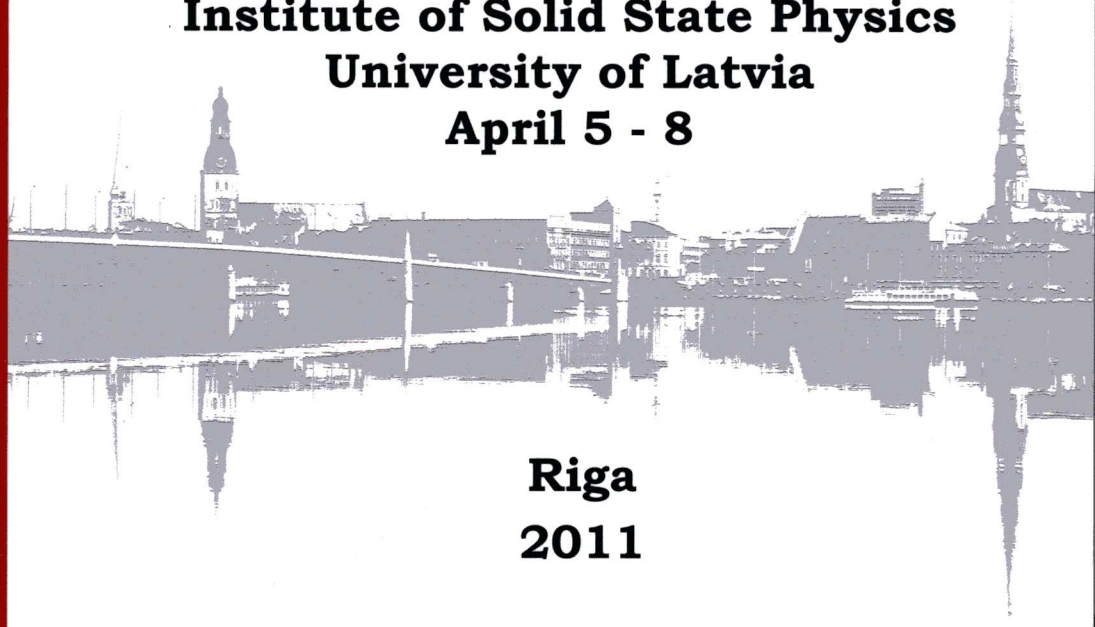

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Evaluation of Analyte Vapour Diffusion in Polymer-Nanostructured Carbon Composite

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Previously polymer-nanostructured carbon composite (PNCC) electrical resistance response, when the composite is exposed to different volatile organic compounds (VOC), has been investigated and determined. As PNCC electrical resistance change is a result of VOC molecule diffusion in the composite and subsequent swelling, then analyte diffusion behaviour evaluation is essentially important.

According to classical analyte diffusion theory into polymers, diffusion behaviour can vary from Fickian to non-Fickian type diffusion depending on the structure of the polymer (amorphous-rubbery, amorphous-glassy or crystalline). Diffusion type indirectly characterizes mobility of polymer segmental unit. Rapid PNCC response to VOC and fast electrical resistance recovery can be enabled by choosing polymer matrix with high segmental unit mobility. To determine analyte diffusion type into the composite and correlate diffusion characteristics with PNCC electrical resistance change, experimental setup has been build with possibility to register simultaneously the PNCC sample mass, length and electrical resistance change.

VOC diffusion characteristics (diffusion velocity and type) into the composite sample depending on used nanostructured filler material (carbon black nanoparticles or carbon nanotubes), filler content, matrix material structural state as well as type of analyte have been evaluated.