

## Effect of carbon nanoparticle agglomeration on properties of conductive and sensitive polyisoprene nanocomposites

**Authors :** Maris Knite<sup>1</sup>, Leonid Dolgov<sup>2</sup>, Kaspars Ozols<sup>1</sup>, Gita Sakale<sup>1</sup>, Juris Zavickis<sup>1</sup>, Raimonds Orlovs<sup>1</sup> <sup>1</sup>Institute of Technical Physics, Riga Technical University, Latvia <sup>2</sup>Institute of Physics, University of Tartu, Estonia

**Resume :** Our recent research approved that electroconductive polyisoprene/nanostructured carbon composites (PNCC) perform promising piezoresistive and chemoresistive properties. It was also stated that such sensitive composites achieve the necessary electric conductivity only after vulcanization under specific conditions. In this work we present an original attempt to investigate the development of percolative electroconductive carbon nanoparticle grid in PNCC during vulcanization phase. For this reason the "in situ" measurements of electric resistivity have been performed during the vulcanization process. Additionally, complex electric conductivity, dielectric spectroscopy, FTIR ATR, Raman spectroscopy and SEM measurements have been made for samples with discrete values of vulcanization time. SEM pictures showed subsequent growth of carbon nanoparticle agglomerates versus vulcanization time. Main processes have been evaluated that affect the formation of electro-conductive percolation grid during vulcanization phase. An interesting correlation between SEM, FTIR ATR, Raman spectroscopy, dielectric spectroscopy and conductivity measurements of PNCC have been found. Piezoresistivity, piezopermittivity as well as chemoresistivity effects have been tested for samples with different level of carbon nanoparticle agglomeration.