



## ENTIRELY HYPERELASTIC PRESSURE SENSOR SYSTEM

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### ABSTRACT

Our recent research approved polyisoprene nanostructured carbon black composite (PNCBC) as a promising material for soft - hyperelastic piezoresistive pressure sensor application. Compared to other materials that are used for pressure sensors the PNCBC is relatively cheap, hyperelastic and is easily produced in various shapes and sizes.

In the current article we present an original attempt to develop completely hyperelastic pressure sensor system using layered composite approach. The composite layers are made only from PNCBC elements with various carbon black concentrations that have been semivulcanised separately so that they could maintain their shape during the final vulcanization when all elements are cured together to form a uniform sensor system. Raw rubber compositions with necessary vulcanization ingredients and variable electro conductive carbon black concentrations were made in Baltic Rubber factory. Electrical percolation shift as well as piezoresistive effect under 1 and 10 atmospheres of pressure was determined to evaluate most suitable PNCBC for each element. These properties are known to be crucially dependent on the geometry and the structure of the conductive filler as well as mixing methods. To improve sensors sensitivity we used 6 piezoresistive elements that were connected in series connection but it is also possible to monitor each element response if we use a different electrode placement in composite layers. The dimensions of developed sensor system are 100x70x5mm but they are easily adjusted for a specific requirement.

The elaborated sensor system is capable to detect pressure, vibration or impact changes. We believe that it is a good competitor in field of tactile sensors or artificial skins.