

Actuations of polymeric nanocomposites containing carbon nanotubes

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Since discovery of carbon nanotubes (CNT) [1] enormous efforts are focused on the exploitation of CNT in many applications as conductive nanocomposites, sensors, energy storage devices, etc. Recently, nanotube-enriched elastomeric polymers have shown photo-actuating properties. The actuation effect is caused by the ability to change materials physical dimensions in response to external stimuli and transfer various form energy to mechanical work.

Results of photo(thermo)-actuating behaviour of nanocomposites based on the commercial elastomer such as ethylene-vinyl acetate copolymer (EVA) filled with well dispersed CNT will be presented. Specimens were prepared in the form of the Braille elements and in the form of strips. Braille elements after irradiation with light diode expanded as monitored in situ by SEM technique [2].

EVA/CNT nanocomposites in the form of strips were more deeply studied under light irradiation with LED using dynamic mechanical analysis. Testing of the composite EVA/CNT original strips and strips uniaxial pre-strained up 10 % of original length upon 10 and 30 s illuminations showed reversible contractions. When strips were uniaxial pre-strained more than 10 % of original length and tested using the same diode and power, reversible expansions of nanocomposites were detected. Bi-modal actuation of nanocomposite was confirmed.

EVA/CNT composites exhibit stability along several cycles maintaining the reversible photo-actuation behaviour, showing high potential for the fabrication of small actuators and devices.

References.

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- [2] K. Czaniková, I. Krupa, M. Ilčíková, J. Mosnáček, P. Kasák, D. Chorvát, Jr., M. Valentin, M. Slouf, M. Micusik, M. Omastová, *J. Nanophotonic*, **2012**, 6, 063522.