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Abstract

Strain Sensor Based on the Biological Nanomaterial †

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Abstract: We investigated prototype of the strain sensor based on the layers of the bionanomaterial contained bovine serum albumin (BSA - matrix), and multi-walled carbon nanotubes (MWCNT - filler). The aqueous dispersion of 25 wt.% BSA/0.3 wt.% MWCNT was applied by screen printing on flexible polyethylene terephthalate substrates. After drying layers by the laser irradiation (~ 970 nm) various parameters of layers were controlled, i.e., resistance *R*, bending angle θ, number of cycles n, measurement time, etc. One measurement cycle corresponded to a change within the range θ = ≈ ±150°. The layers of BSA/MWCNT bionanomaterial were de mentions: (15 ÷ 20) mm × (8 ÷ 10) mm × (0.5 ÷1. 5) μm. The dependences of resistance R on the bending angle θ were similar for all layers: at θ = ± 30, the *R*(θ) curves represented approximately linear dependences (with an error of ≤ 10%); beyond this range, the dependences became nonlinear. The following quantitative values were obtained for the investigated strain sensor: specific conductivity ~ 1 ÷ 10 S/m, linear strain sensitivity ~ 160, bending sensitivity 1.0 ÷ 1.5%/°. These results are high. The examined layers of the bionanomaterial BSA/MWCNT as a strain sensor is of a particular interest for medical practice. In particular strain sensors can be implemented by applying a water dispersion of nanomaterials to human skin using a 3-D printer for monitoring: movements (arms, blinking) and detection of signs of pathology (dysphagia, respiratory diseases, angina, et. al.).

Keywords: strain sensor; bovine serum albumin; multi-walled carbon nanotubes; laser irradiation; strain sensitivity