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Smart-fabric sensor composed of single-walled carbon nanotubes containing binary polymer composites for health monitoring

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Abstract

A smart-fabric sensor for health monitoring has been fabricated using composite of single-walled carbon nanotubes (SWCNTs)-filled binary polymer of poly vinylidene fluoride/poly(3,4-ethylenedioxythiophene)-poly(styrenesulfonate) (PVDF/PEDOT:PSS). The response curves and working principle were investigated, and sensors were fabricated to achieve a highly linear and stable response for a wide range of temperatures (25–100 °C) and bending angles. The sensors show a stable and nearly linear response of impedance change by varying temperatures in the range of 25–100 °C. The impedance of the sensors changed from 5.8 MΩ to 2.95 MΩ for temperature change in the range of 25–100 °C with a sensitivity of 38 kΩ/°C. The bending movement sensitivity of the sensors was found to be 90 kΩ per degree angle, and the response of the sensor was very stable in the range of 0–120°.

Keywords: A. Carbon nanotubes; A. particle-reinforced composite; B. electrical properties; B. durability.

Introduction

The wearable devices industry has been growing rapidly for the last five years, and wearable electronic devices are incorporated from headwear to footwear. The most