Carbon nanotubes and graphene powder based multifunctional pressure, displacement and gradient of temperature sensors

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This work presents the fabrication and investigation of the multiwalled carbon nanotubes (MWCNTs) and graphene pristine powders based multifunctional pressure, displacement and gradient of temperature sensors. The effect of pressure on the resistance, Seebeck coefficient, thermoelectric voltage and current of the sensors was measured by changing pressure from 0 to 1.65 kgf/cm^2, while the effect of temperature gradient on the resistance, thermoelectric voltage and current of the sensors was measured up to the temperature gradient of $34-36^\circ$C. Dependence of the resistance on longitudinal compressive displacement up to 100 μm was investigated. It was found that the resistance, Seebeck coefficient and thermoelectric voltage of the CNT and graphene powders decreased with increasing pressure, while the thermoelectric current increased with pressure. Moreover, with increasing temperature gradient and average temperature a considerable increase was observed in thermoelectric current and voltage, while the increase in resistances was moderate. The increase in longitudinal displacement resulted in the compression of the samples that caused to decrease the resistances of the samples, especially in the case of samples made from CNT and graphene both. The simulation of the experimental results was carried out by using of linear functions and the results of simulations were in good agreement with experimental results.

Keywords: Carbon nanotubes, Graphene, Multifunctional sensor, Pressure, Temperature gradient.

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