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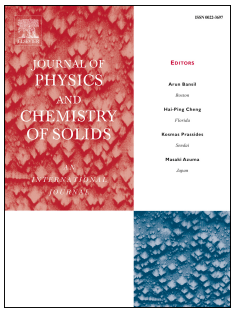

Carbon-silica nanocomposite with negative differential resistance for high voltage negatronic devices: Effect of silica concentration

S. Gouadria, I. Najeh, L. El Mir

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Carbon-Silica Nanocomposite with Negative Differential Resistance for High Voltage Negatronic devices: Effect of silica concentration

S. Gouadria[1], I. Najeh [(1,*)], L. El Mir[(1,2)]

[1]Laboratory of Physics of Materials and nanomaterial's applied at Environment (LaPhyMNE), Gabès University, Faculty of Sciences, Cite Erriagh Manara Zrig 6072, Gabès, Tunisia.

[2]Al Imam Mohammad Ibn Saud Islamic University (IMSIU), College of Sciences, Department of Physics, Riyadh 11623, Saudi Arabia.

*Corresponding author E-mail : Imededdine.Najeh@yahoo.fr

Tel: +216 96 88 97 98, Fax: +216 75 39 24 21

Abstract

In this work, carbon-silica nanocomposites have been elaborated by sol-gel technique. SiO_2 nanoparticles were added to resorcinol-formaldehyde (RF) carbon precursor solution with different silica weight percentages. The XRD investigations carried out on these samples outline that the material has amorphous phase. The transmission electron microscopy (TEM) images show the presence of nanostructures in RF-30% SiO_2 and RF-50% SiO_2 samples. The electrical conductivity was investigated in the temperature range 80–300 K and in the frequency range 100 Hz–1 MHz. The dc and ac conductivity can be explained by hopping conduction model. Current-Voltage characteristics exhibit nonlinear and symmetric behavior for all measurement temperatures between 80 K and 300 K. In addition, a negative differential resistance (NDR) phase has been detected even at room temperature in RF-50% SiO_2 non dispersive sample. These investigations will contribute to the fabrication of thermal and high voltage negatronic devices working at room temperature where NDR plays an important role.

Keywords: nanocomposite; Joule heating effect; Negatronic.