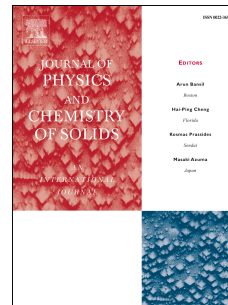


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Carbon-Silica Nanocomposite with Negative Differential Resistance for High Voltage Negatronic devices: Effect of silica concentration

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Abstract

In this work, carbon-silica nanocomposites have been elaborated by sol-gel technique. SiO₂ 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% SiO₂ and RF-50% SiO₂ 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% SiO₂ 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.

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