applied sciences

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Communication

Negative Differential Resistance and Long-Lived Changes in the Electrical Conductivity of Carbon Composites Induced by Electrothermal Effects

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Supplementary Materials

In this supplementary Materials, the conductivity of a sample doped with 5% of ZrO_2 nanoparticles was compared to the conductivity of a sample fabricated using only pyrogallol-formaldehyde (pristine samples). As shown in Figure S1, the sample with ZrO_2 nanoparticles exhibits higher electrical conductivity than the pristine sample.

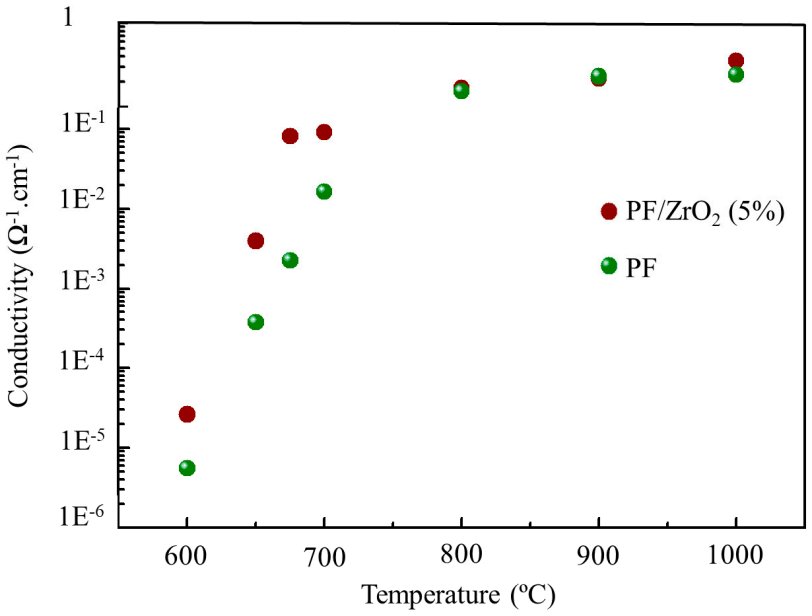

Figure S1. Comparison between the electrical conductivity of the pyrogallol-formaldehyde sample with the sample doped with 5% of ZrO_2 nanoparticles. The conductivity was measured for several pyrolysis temperatures.

The current-voltage characteristics of a pyrogallol-formaldehyde sample without ZrO_2 nanoparticles were studied. These samples, referred to as pristine samples, were found to be more insulating compared to samples doped with 5% ZrO_2 nanoparticles. We also observe that ZrO_2 nanoparticles do not directly contribute to the negative differential resistance (NDR) observed in the I-V curves. As demonstrated in Figure S2 samples

Citation: Ahmed, W.; Chouiref, L.; Dahman, H.; El Mir, L.; Gomes, H.L. Negative Differential Resistance and Long-Lived Changes in the Electrical Conductivity of Carbon Composites Induced by Electrothermal Effects. *Appl. Sci.* **2023**, *13*, 1069. https://doi.org/10.3390/app13021069

Academic Editor: Vardan Galstyan

Received: 21 November 2022
Revised: 5 January 2023
Accepted: 10 January 2023
Published: 13 January 2023

prepared without ZrO_2 nanoparticles also exhibit NDR. Furthermore, upon Joule heating, we also observed long-lived relaxation effects on the sample conductivity.

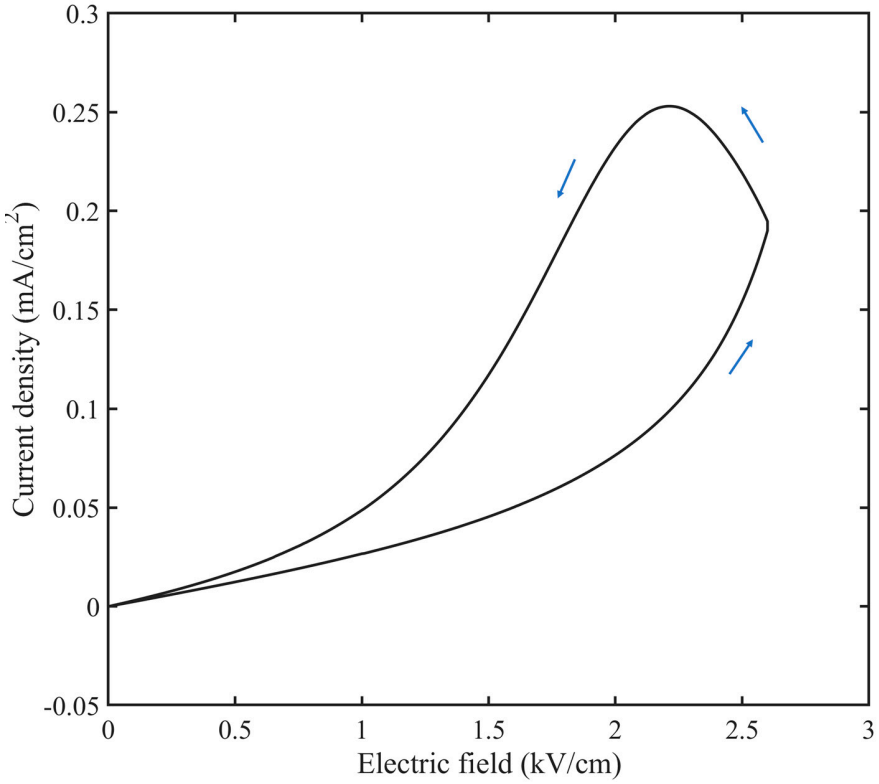

Figure S2. Current-voltage characteristics of a pyrogallol-formaldehyde sample without ZrO_2 nanoparticles. The voltage scan rate was 1 V/s. The sample has an active area of 0.008 cm^2 and a thickness of 0.05 cm.