**DNA-ASSISTED STABILIZATION OF GRAPHENE SHEETS AND ITS APPLICATION AS SUPERCAPACITORS ELECTRODE**

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The work reports on the formation of rGO/ssDNA composite by stabilizing rGO sheets in an aqueous solution containing ssDNA extracted from baker’s yeast culture. The as-formed rGO/ssDNA composite is verified using spectroscopic and microscopic techniques, including Fourier transform infrared (FTIR), Raman, and photoluminescence (PL) spectroscopies, and field emission scanning electron microscope (FESEM). Physical investigations show the successful stabilization of rGO suspension by ssDNA for more than a month without the rGO sheets precipitation. The highly charged backbone of ssDNA comprising phosphate groups, nucleic-bases, and sugar molecules contribute to the rGO stabilization and could be potential electrode material for charge storage supercapacitor. The electrochemical investigations confirm the electrochemical double-layer capacitance behavior of rGO/ssDNA composite in KOH electrolyte, where nearly 2-fold capacitance enhancement is observed compared to pure rGO.

The oxygen residues on ssDNA are proven to contribute to the electrochemically active surface area of rGO/ssDNA. By virtue of the proposed material and approach simplicity and environmentally benign, it can be considered as a promising candidate for further processing and practical applications of bio-supercapacitors.

Key words: DNA; Graphene; Bio-supercapacitor.

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**Ethics declarations: Conflict of interest**

The authors declare that they have no conflict of interest.

REFERENCE

1. Burley G.A., Gierlich J., Mofid M.R., Nir H., Tal S., Eichen Y., Carell T. (2006) Directed DNA metallization, J. Am. Chem. Soc. 128, 1398–1399.

2. Liu J., Geng Y., Pound E., Gyawali S., Ashton J.R., Hickey J., Woolley A.T., Harb J.N. (2005) Metallization of branched DNA origami for nanoelectronic circuit fabrication, ACS Nano. 5, 2240–2247.

3. Kwon Y.W., Lee C.H., Choi D.H., Jin J. Il (2009) Materials science of DNA, J. Mater. Chem. 19, 1353–1380.