Performance analysis of the reduced graphene oxide/carbon fiber binary composite as electrode for supercapacitor application

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The growing demand for portable electronic devices and hybrid electric vehicle, it has become necessary the development of the new materials to applied as portable energy sources. Recently, carbonaceous materials have received great attention to use in energy storage devices due to its outstanding properties like large specific surface areas, conductivity and chemical stability. Among them, the reduced graphene oxide (rGO) is one of the most innovative materials used as flexile electronic devices due to its excellent electrical conductivity and flexibility [1]. In this context, the goal of this work was production and characterization of the rGO/carbon fiber (CF) binary composite applied as electrodes in supercapacitors. The rGO electrodeposition on CF (1 cm^2) was performed at a fixed potential of -1.25 V *vs*. Ag/AgCl/$KCl_{(sat)}$ during 15 min in a 25 mL of the graphene oxide (3mg mL^{-1}) + 0.1 mol L^{-1} $LiClO_4$ aqueous solution. The SEM-FEG images showed aggregates with irregular and flakes-like shape with high particle density on CF substrate, which is a characteristic of the rGO. The electrochemical characterizations were performed by cyclic voltammetry (CV), and charge/discharge tests. The CV curves presented a quasi rectangular shape without apparent redox peaks, indicating that the charge storage occurs preferentially through of the rGO/CF electric double layer. The curves obtained with the galvanostatic tests showed a long time of the charge/discharge, improving the capacitance value, probably attributed a high surface area of the rGO/CF binary composite. These result showed that rGO/CF composite has a great potential as new promising electrodes for applications in supercapacitors.

Acknowledgements:
FAPESP, CAPES, CNPq, EMBRAPA and MCTI-SisNAno.

References:
[1] Y. Cao et al. Phys.Chem. Chem. Phys., **15**, 19550 (2013)