Synthesis and characterization of polypyrrole coated graphene nanosheets with enhanced electrical properties

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Graphene nanosheets have potential applications in energy storage devices like supercapacitors, fuel cells or other power source systems due to free standing layers having high electrical conductivities and large surface area. Polypyrrole (PPy) is one of the most significant conducting polymers because of its relatively easy processability, electrical conductivity, and environmental stability [1]. Consequently, the production of PPy/graphene nanosheets based nanocomposites by several chemical and electrochemical techniques provides to enhance electrical and thermal properties of these products [2].

In the initial work, graphene nanosheets were fabricated in large quantatity via a safer and improved chemical synthetic route involving oxidation, thermal exfoliation and chemical reduction. Then, coating of conducting PPy on graphene nanosheets was carried out by in situ polymerization by changing the pyrrole/graphene nanosheets ratio, Fig. 1. The properties of PPy/graphene nanosheets composites were tuned by altering the monomer concentration during coating.

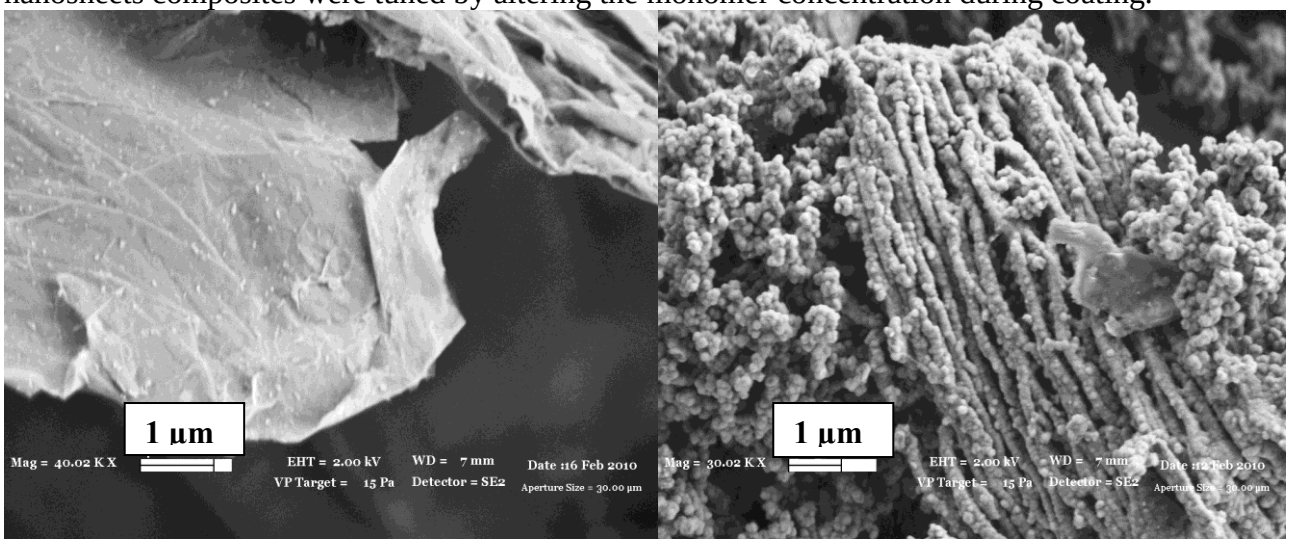

Fig. 1. (a) Graphene oxide nanosheets and (b) PPy coated graphene oxide sheets (the ratio by weight between monomer and graphene oxide nanosheets as 1:1)

The morphology and microstructure of all samples in each step of the procedure were analyzed by SEM, XRD, FTIR and Raman spectroscopy. Electrical properties of the samples were investigated with the preparation of pellet electrodes. PPy/Graphene nanosheets composites can be utilized as an electrode material in fuel cells.

References

[1] G. G. Wallace, J. Chen, A. J. Mozer, M. Forsyth, D. R. MacFarlane, C. Wang, *Materialstoday* **12** (2009) 20-27.
[2] N. G. Sahoo, Y. C. Jung, H. H. So, J. W. Cho, *Synthetic Metals*, **157** (2007) 374–379.