

Hybrid polyoxometalate/reduced graphene oxide composites for supercapacitors.

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Abstract

In this work, we present the novel synthesis and electrochemical study of polyoxometalate-graphene oxide hybrid materials to be used as electrode in Supercapacitors (SCs). The synthesis involves the reduction of graphene oxide (GO) with simultaneous incorporation of polyoxometalate (POM).¹ The existence of the strong chemisorption between polyoxometalate and graphene oxide makes it possible to construct stable hybrid carbon structures.

Hybrid materials were carried out in a single step by means of a hydrothermal treatment (120 °C, 24 h) of an aqueous solution of polyoxometalate: $\text{H}_3\text{PMo}_{12}\text{O}_{40} \cdot 10\text{H}_2\text{O}$ (PMo_{12}) and exfoliated graphene oxide (GO). The resulting materials (labeled HT-RGO- PMo_{12}) was filtered-off, washed and dried at 50 °C overnight. The amount of POM impregnated was determined by TGA. A similar treatment of a GO sample without POM added was carried out for comparison (sample HT-RGO).

Figure 1 shows the HR-TEM images of the blank HT-RGO sample (Fig. 1A) and HT-RGO- PMo_{12} (Fig. 1B). The presences of the inorganic POM clusters on the surface graphene are clearly detected in the latter image, and are evenly distributed at a truly molecular level and no agglomerate or nanocrystal could be detected.

The electrochemical characterization of the hybrid materials was tested by cyclic voltammetry and galvanostatic charge-discharge test in two- and three- electrodes configurations, where platinum wire and Ag|AgCl were used as counter and reference electrode, respectively. 1 M H_2SO_4 was the electrolyte.

References

[1] Suárez-Guevara, J.; Ruiz, V.; Gomez-Romero, P. *J. Mater. Chem. A*, **2** (2014), 1014 – 1021.

Figures

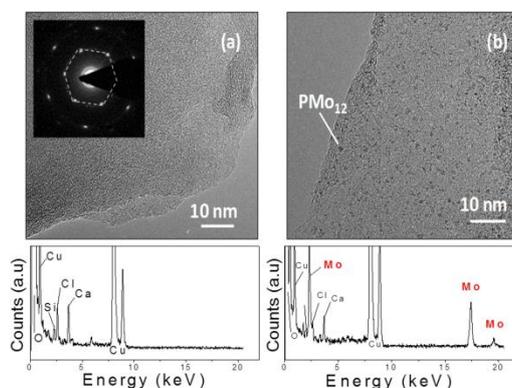


Figure 1. - HR-TEM images of HT-RGO (A) and HT-RGO- PMo_{12} (B). Scale bars are 10 nm.