Graphene based supercapacitor with alkaline aqueous electrolyte

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Graphene can potentially be applied as electrode material for electrochemical double layer capacitors, due to high surface area and good electrical conductivity [1,2]. Recen studies on graphene show that synthesis of this material is simple and requires only the use of a few low cost inorganic compounds. Additionally, thermal conversion of graphene oxide to reduced graphene oxide can be carried out at moderate temperatures [3].

The aim of this work was the determination of electrical parameters of graphene based supercapacitor operating in alkaline aqueous electrolyte. In our work graphite oxide was prepared from graphite by a modified Hummers method [4]. Graphite oxide was ultrasonically dispersed to form a homogeneous graphene oxide water suspension. Next, water was evaporated by vacuum rotary evaporator. The obtained material was thermally reduced with and without ammonium carbonate in a muffle furnace at 523K during two hours. The obtained materials were characterized by X–ray diffraction and elemental analysis. Texture, morphology and particle size of the synthesized materials were observed by scanning and transmission electron microscopy.

The electrochemical properties of the reduced graphene oxides as electrodes in a symmetric electrochemical double-layer capacitor filled with 6M KOH electrolyte are presented. Electrochemical characterization performed by galvanostatic charge/discharge and electrochemical impedance spectroscopy tests were carried out to assess the capacitance properties of the devices. This measurements confirm high specific capacitance of reduced graphene oxides as electrode material. Simultaneously, cycling voltammetry studies show a high redox peak in range from 0.5 to 0.8 V voltages corresponding to electrolyte decomposition. Graphene can be considered as a promising material for electrochemical capacitors.

Acknowledgments

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References

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Figures

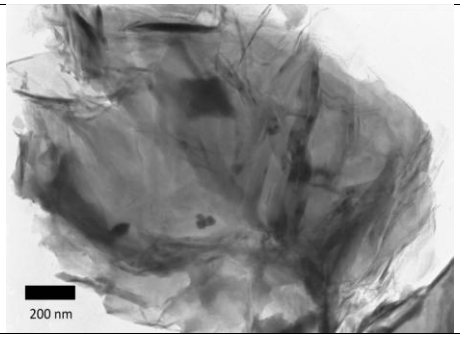

Figure 1: TEM image of thermally reduced graphene oxide in air atmosphere