A supercapacitor (SC) whose electrodes and separator were fabricated from graphite oxide reduced by a microwave exfoliation (MEGO) and the paper formed after precipitation of water suspension of graphene oxide, respectively, was designed for the first time. The specific capacitance of this SC exceeded 200 F/g and was essentially higher than the specific capacitances of SCs based on activated carbon. The significant increase in the specific capacitance is related with a larger specific area available for the water electrolyte in the case of MEGO electrodes. The specific area of our MEGO is 2400 m$^2$/g if measured using the standard contact porosimetry method, whereas it is several times smaller (~600 m$^2$/g) when measured by using the Brunauer–Emmett–Teller method based on the low-temperature nitrogen adsorption. By using the angle resolved X-ray photoelectron spectroscopy, we found that surface layers of the paper separator contain a smaller oxygen concentration than the bulk layers.

We showed a new concept that a supercapacitor whose main components are composed of carbon materials obtained from graphite oxide can be fabricated. In particular, the electrodes of our supercapacitor were made from graphene oxide obtained using microwave exfoliation and the separator was made from graphene oxide paper that forms after precipitation of water suspension of graphene oxide.

The graphene oxide paper impregnated with water or water solutions of acids appears to possess the properties similar to those of membranes of the Nafion type (a high hydrophilicity, a high porosity, a high specific surface area along with strong protonic conductivity). One can anticipate that the GOP may be used when fabricating fuel cells.

Keywords: Graphene oxide, Supercapacitor, Proton conductivity

References:

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