Electrochemical properties of PANI/EG composites: Effect of Dopant and Oxidant

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Abstract

Optimizing the synthesis parameters of polyaniline/graphite nanoplate (PANI/GNP) composite is essential to the final electrochemical performance [1,2]. Herein, we investigated the electrochemical properties of PANI/GNP composites, prepared by in-situ chemical polymerization, in dependence on composition, amounts and type of oxidant, and presence of 4-dodecylbenzenesulfonic acid (DBSA) as dopant. Cyclic voltammetric results suggested that a stoichiometric amount of the oxidant iron chloride (FeCl3) was beneficial to the electrochemical properties of the composites. The use of ammonium persulfate (APS) instead of FeCl3 as oxidant largely increased the PANI content, conductivity, and specific capacitances of the PANI/GNP composites (Fig. 1). The dopant DBSA increased the conductivity of PANI/GNP 1:1 and 1:0.1 composites, but did not show a positive effect on the electrochemical behavior. In this study, PANI/GNP (1:1) composite synthesized with an APS to aniline molar ratio of 1 showed a balanced combination of high specific capacitance and good rate capability. Additionally, the difference between the cyclic voltammograms of PANI/GNP 1:1 and 1:0.1 composites indicated that the pseudocapacitance of PANI contributes more than the electrical double-layer capacitance of GNP to the capacitance of composites, while the presence of GNP plays an essential role in the rate capability of the composites.

References

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Figures

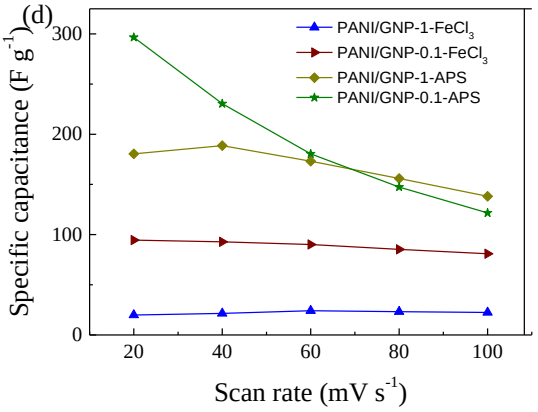

Figure 1: Effect of PANI/GNP composition (by wt.) and oxidant type on capacitance (Oxidant to monomer ratio =1 (by mol), no surfactant