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Synthesis and electrochemical properties of phosphorus doped GO/porous carbon

Supercapacitor is a kind of green device between traditional capacitor and battery, because of its high power density, light weight, multiple charge and discharge, long cycle life as well as maintenance-free, and become a new type of energy storage device[1]. As an useful, efficient, environmental friendly energy storage device, It has broad prospects. Graphene has excellent optical, mechanical and electrical properties. Graphene oxide has attracted much attention because of its lamellar structure and high conductivity. In recent years, many researchers have used GO to make electrode materials for supercapacitors. Porous carbon as one of promising materials is widely used in supercapacitors. And adding GO in carbon materials can effectively improve the conductivity of carbon materials. However, pure carbon material due to its surface hydrophobicity, large internal resistance, its development has been severely constrained[2]. The introduction of phosphorus elements, can effectively enhance the performance of porous carbon[3]. Therefore, phosphorus doped GO/porous carbon materials in recent years has been a wide range of attention and research.

In this study, As the precursor, phosphorus doped GO/sodium alginate composite by sol-gel method. At the same time, sodium alginate and GO as carbon source, sodium hypophosphite as phosphorus source while Iron nitrate as catalyst and porogenic agent. The precursor was freeze-dried for 48 hours and activated by KOH. Finally, the mixture was carbonized to 700 degrees in N_2 atmosphere to obtain phosphorus doped GO/porous carbon. The results showed that the mass ratio of sodium alginate to sodium hypophosphite was 1:1, the porous carbon material possesses the best electrochemical performance with a high specific capacitance of about 348 F g^{-1} at a current density of 0.5 A g^{-1}. Moreover, its cyclic voltammetry curve shows a good rectangular shape. From the SEM, It was obviously find that the GO lamellar structure interspersed and constructed three-dimensional porous carbon materials. As a result, the composite porous carbon materials demonstrate an effective improvement of the performance for the electric double layer capacitor and great potential in supercapacitors.

References

[1].Q Long ,W Chen ,H Xu ,X Xiong ,Y Jiang etc. Energy & Environmental Science , 2013,6 (8) :2497-2504

[2]. X Yan ,Y Liu ,X Fan ,X Jia ,Y Yu etc, Journal of PowerSources , 2014 , 248 (248) :745-751

[3]. J Chen ,H Wei ,H Chen ,W Yao , H Lin etc, Electrochimica Acta , 2018 , 271

Figures

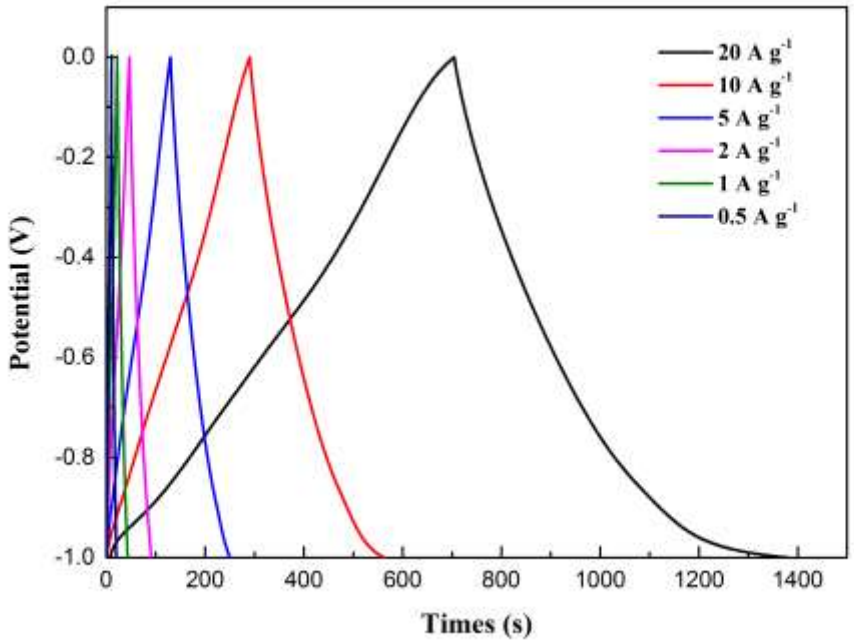

Figure 1. the charge discharge curves of 0.40-GO/SA at current density from 0.5 A g^{-1} to 20A g^{-1}

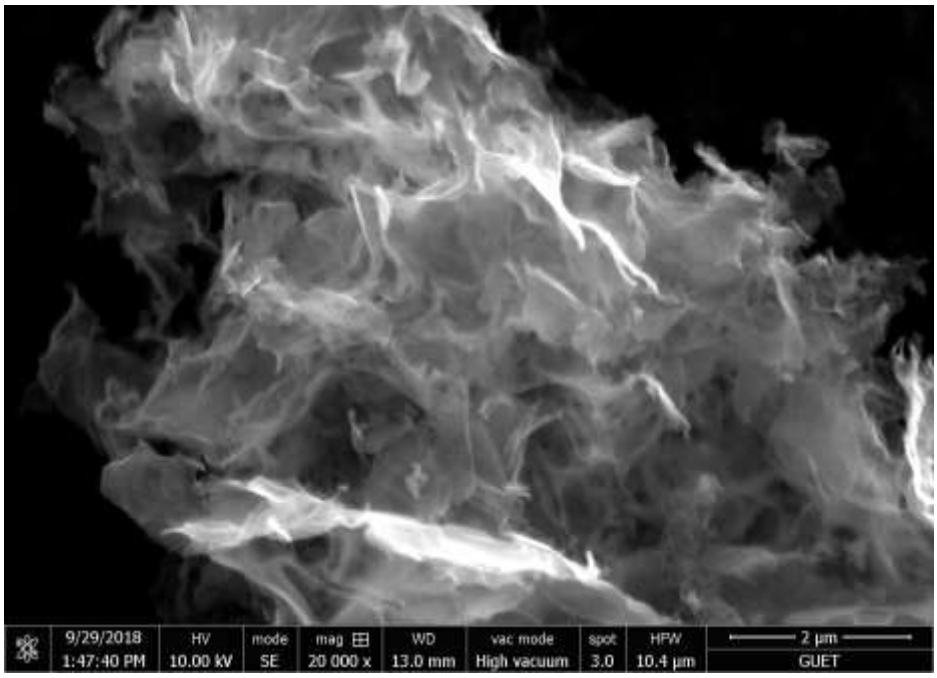

Figure2. SEM of 0.40-GO/SA at 20K magnification