ISSN: 2790-5209 DOI: 10.56028/fesr.1.3.20

Preparation of carbon - based nanocomposites and their application in the anode of lithium ion batteries

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Abstract

At present, with the increasing demand for electronic products, accompanied by the rise of new energy vehicles, the application of lithium-ion batteries in life is gradually popular. Used for commercial purposes of lithium battery cathode on the characteristic with non-toxic cut the advantage of cost control more successful, but its development in the future have received the restrictions in terms of the specific capacity, so using carbon nano composite material has become the new direction for the future development of lithium ion battery cathode, this article will also with its as the research direction for research.

Keywords

Carbon-based nanocomposites; Lithium ion battery anode; Metallic organic matter

1. Research situation of lithium ion battery negative electrode

1.1. Basic information of anode materials for lithium-ion batteries

The anode materials of lithium ion batteries can be divided into embedded materials, displacement materials and alloy materials. The electrochemical activity of embedded materials comes from the embedding of lithium ions into the graphite layer, and it is precisely because of such characteristics that it has good conductivity and low cost [1]. Displacement materials are embedded materials that undergo displacement reactions with lithium ions. Common transition metals include oxides, sulfide and phosphide. The specific chemical reaction formula is as follows:

$$M_xN_y + zLi + ze \Leftrightarrow LiNy + xM$$

As far as the current situation is concerned, considerable progress has been made in the study of transition metal oxides, and many common metals such as iron and nickel can be added to enhance their structural advantages, which is naturally worth studying. Finally, there is usually the possibility of volume change in the process of practical application of alloy materials. Therefore, it is necessary to pay attention to the rule of volume change in the process of research. See the table below for details of the rule of volume change.

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Initial raw materials	C	AI	Si
Theoretical Value Variables (Ah / kg)	356	2236	4009
Theoretical Reference Variables (Ah / L)	876	6515	9540
volume change (%)	13	236	287

Table 1 Comparison of the volume change of lithium embedded in alloy materials

1.2. Research Progress

With the increasing demand for new energy, the demand for energy density of battery materials is also increasing. With the continuous development of research, the highest density of lithium batteries for commercial use has exceeded 250WH kg-1. This is close to the limit of lithium-ion batteries. After comparing with other materials, it is found that lithium, as a host-free material, still precipitates on lithium metal and will continue to react after electrochemical reduction. Therefore, its future development direction should first be solid-state treatment of electrolyte, and then SEI should be improved. The specific direction of improvement should first be to solve the problems of low Coulomb efficiency and cycle life segment caused by the poor stability of its mechanical structure. The specific solutions include pre-embedding and using lithium powder.

2. Application of CoSe/@NC composites

2.1. Applied characterization analysis

The actual content analysis of the characterization of CoSe/@NC composites includes thermogravimetric analysis, electron microscopy, X-ray spectroscopy and Raman spectroscopy. The specific method of thermogravimetric analysis is to use air as the atmospheric material, and the heating range is 30-900 degrees Celsius. Electron microscope respectively divided into transmission microscope and scanning microscope, transmission microscope used in specific ways due to CoSe / @ NC section has a certain magnetism, so in order to make its are not affected will completed the sample pretreatment, the preprocessing of concrete are respectively the cladding in resin finish section and the use of hydrochloric acid solution to clean. Finally, the excitation light source used in the characterization analysis of Raman spectroscopy is subion, which is also measured in the laboratory environment [2].

2.2. Application Performance Analysis

After the analysis of application characterization by the above method, cyclic voltammetry was used to complete the relevant discharge test first, and the actual scanning rate was up to 0.2 by calculation. In the process of recycling, it can be seen that the lithium storage space has been greatly improved because of the reversible compounds on the surface of the electric ions. After several cycles of charging and discharging, CoSe/@NC nanoions are always in the state of volume expansion, so they naturally acquire more fragments to have stronger adsorbability and finally ensure that their structure has sufficient integrity. After adjusting the current

ISSN: 2790-5209 DOI: 10.56028/fesr.1.3.20

density, it can be found that the ratio performance of CoSe/@NC material is relatively excellent. After comparing the thermal cycling efficiency, it can be found that the CoSe/@NC in the battery is still exposed to the electrolyte, so the internal structure may collapse. Therefore, in order to understand it, this paper also carried out the electrochemical performance analysis of different calcination temperatures, the specific results are shown in the following figure 1.

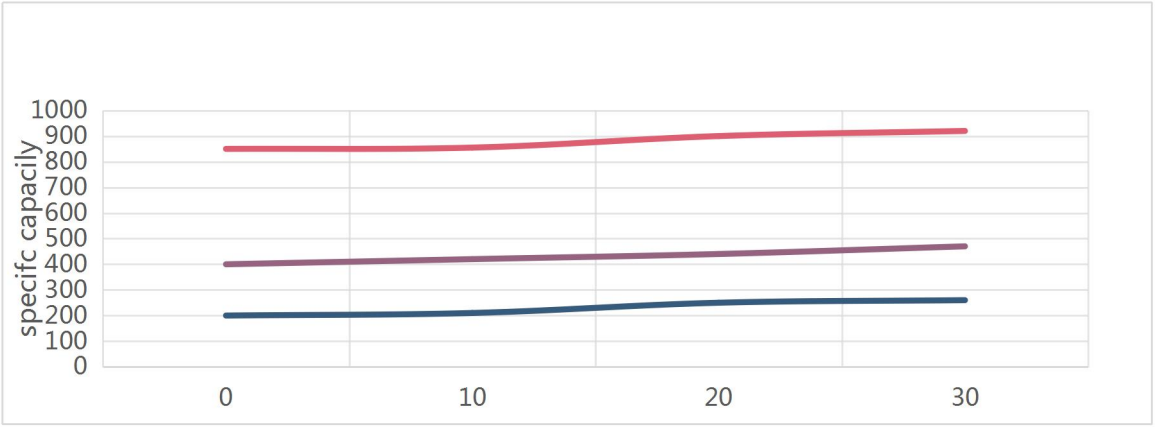

Figure 1 Samples and the electrochemical performance table of CoSe / @NC at constant current

The three curves above show the comparison of the current density and cyclic volume data of CoSe/@NC and the sample, respectively. It can be found that the use of other metals can help to improve the electronic conductivity of CoSe/@NC.

3. Application of silver - carbon hollow nanosphere materials

3.1. Morphology analysis

In the morphology analysis of the silver - carbon hollow nanospheres, the silver mirror reaction is first used to complete the formation of phenolic resin, and then the internal nanoparticles can be obtained. After observation, it is found that the actual chemical composition is not bright enough, so it may be difficult to observe the situation. However, after being treated with a dissolving agent, it can be found that there may be cavities inside the nanospheres and the nanoparticles will remain in the cavities. After potential deposition, most lithium ions are deposited on the surface of copper metal, so it can be seen that the deposition of copper is better than that of silver, and the actual reason for this difference is that the boundary surface of the two is different. The main factor affecting the bounding surface comes from the lattice matching degree of the two. In most cases, the bounding surface decreases with the increase of the matching degree [3].

3.2. Electrochemical test

In the electrochemical test, only the hollow sphere structure can be found in constant change, and the thickness of its shell layer ranges from 40 to 60mm. When the influence of Coulomb effect is small, silver nanoparticles may not be completely wrapped in it, which leads to a large degree of fragmentation of the carbon shell bottom and the inability to control the formation

ISSN: 2790-5209 DOI: 10.56028/fesr.1.3.20

of lithium dendrites. Therefore, it is a very important research direction to find the balance between mechanical strength and electrical conductivity in the future research, and it is necessary to improve the Coulomb effect strength as the core key to constantly adjust its porosity in order to complete the improvement of Coulomb efficiency.

4. Conclusion

According to the study in this paper, the future development direction of the application of carbon-based nanocomposites in the anode of lithium batteries should first control the damage degree of hollow carbon spheres as much as possible, and then reduce the growth rate of lithium crystals. In the process of guiding the synthesis of lithium coating, it should also use ether electrolyte to complete the electrolysis to improve the stability of its coating. The above summary is based on the analysis of the application of CoSe/@NC composite materials and Ag-carbon hollow nanospheres. In the future, the development of CoSe/@NC composite materials should also be implemented in the aspect of observation techniques, for example, non-in situ TEM observation method can be the main goal of future development.

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