SODIUM ION BATTERIES AND GEL ELECTROLYTES

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Abstract: This work deals with the elecdrode materials and gel electrolytes suitable for sodium-ion batteries (Na-ion batteries). In the field of electrode materials were investigated carbon materials based on CR5995 with added SUPERp or NanoTubes for better conduction end LTO material boath working on the principle of insertion of sodium ion in to the electrode material structure. Another part witch this work deals are gel electrolytes for using in this Na-ion batteries, focused on the preparation and subsequent electrochemical and conductivity characterization of gel polymer electrolytes.

Keywords: Sodium, Lithium, Batteries, Cell, Gel electrolyte.

1. INTRODUCTION

Energy production and storage have become key issues concerning our welfare in daily life. Present challenges for batteries are twofold. In the first place, the increasing demand for powering systems of portable electronic devices and zero-emission vehicles stimulates research towards high energy and high voltage systems. In the second place, low cost batteries are required in order to advance towards smart electric grids that integrate discontinuous energy flow from renewable sources, optimizing the performance of clean energy sources. Na-ion batteries can be the key for the second point, because of the huge availability of sodium, its low price and the similarity of both Li and Na insertion chemistries. In spite of the lower energy density and voltage of Na-ion based technologies, they can be focused on applications where the weight and footprint requirement is less drastic, such as electrical grid storage. Much work has to be done in the field of Na-ion in order to catch up with Li-ion technology. Cathodic and anodic materials must be optimized, and new electrolytes will be the key point for Na-ion success. This review will gather the up-to-date knowledge about Na-ion battery materials, with the aim of providing a wide view of the systems that have already been explored and a starting point for the new research on this battery technology. [1]

Figure 5: Electron shell diagram for Lithium, the 3rd element in the periodic table of elements. Electron shell diagram for sodium, the 11th element in the periodic table of elements.

2. SODIUM BATTERY

2.1. SODIUM CELL MEASUREMENTS

Cyclic Voltammetry (CV) is the most widely used technique for acquiring qualitative information about electrochemical reactions. CV provides information on redox processes, heterogenous electron-transfer reactions and adsorption processes. It offers a rapid location of redox potential of the electroactive species. CV consists of linearly scanning the potential of a stationary working electrode using a triangular potential waveform. During the potential sweep, the potentiostat measures the current resulting from electrochemical reactions. The cyclic voltammogram is a current response as a function of the applied potential [4]. Cyclic Voltammentry characteristics. Charge (oxidation) is direction from left to right on upper part and discharge (reduction) is direction from right to left on lower part.

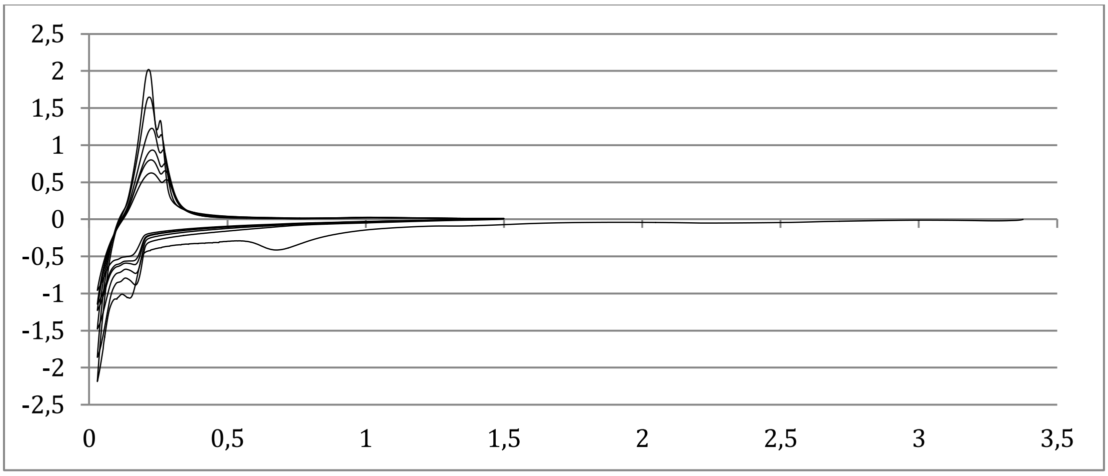


Figure 3: Electrode materiál CR5995+SUPERp+PVDF measured in LiF6 1:1 EC:DMC electrolyte.

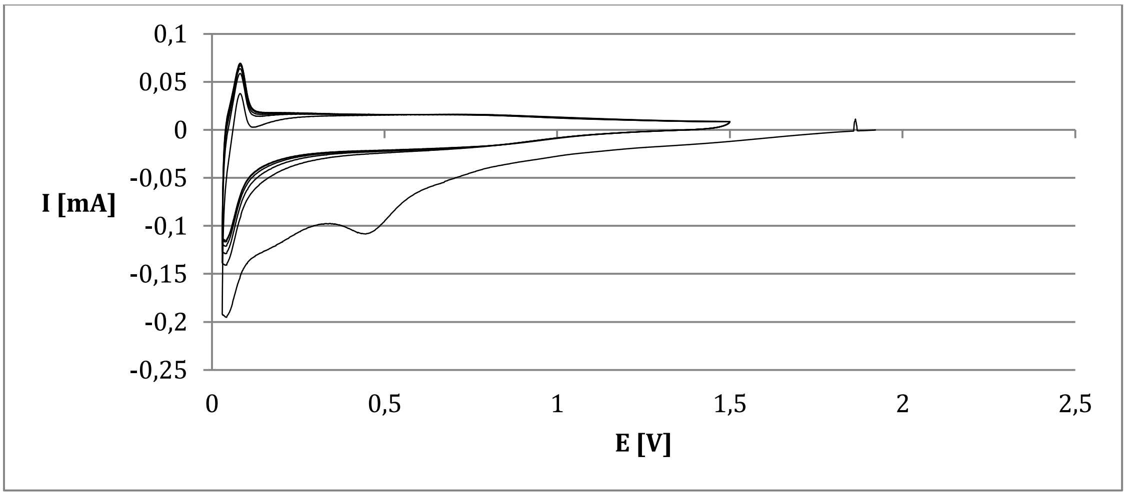
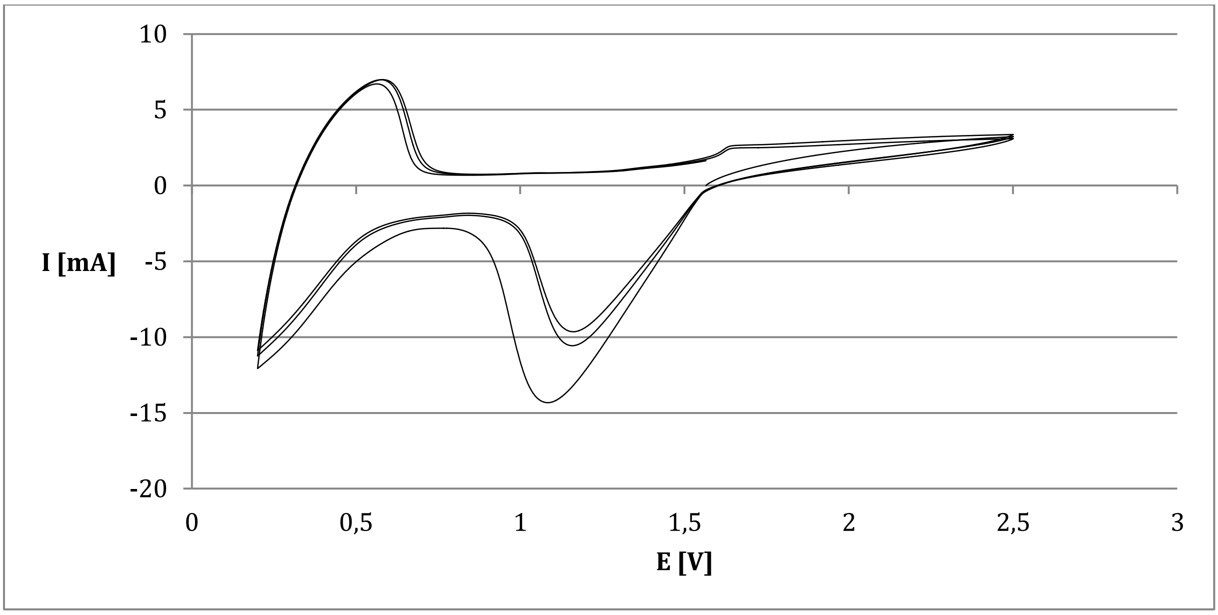


Figure 3: Electrode material CR5995+SUPERp+PVDF measured in NaClO4 1:1 EC:DMC electrolyte.



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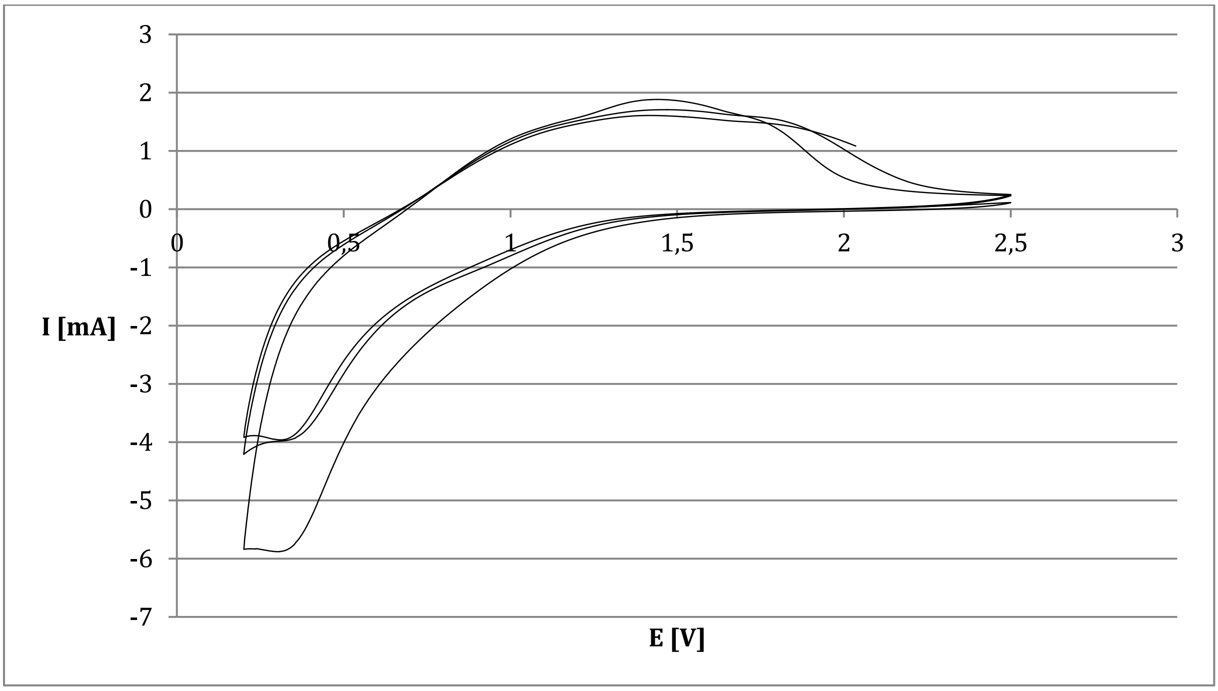

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2.2. PREPARATION AND CHARACKERIZATION OF POLYMER ELECTROLYTES.

Samples are prepared by UV polymerization. The polymerization initiator is a benzoinether eltyl (BEE) and the crosslinker used ethylene glycol dimethacrylate (EDMC) and 1,6-hexanediol dimethacrylate (HexadiMA). [2]

Prepared mixtures is the need to mix in an argon atmosphere of glove box. With the prepared mixture we fill the polymerization cell, which is subsequently embedded for 40 minutes in a UV chamber with a power consumption of 400 W was on it. [2]

Gel polymer electrolyte containing immobilized different types of salts (LiPF6, LiBF4, TEABF4) in aprotic solvents (PC, EC:DEC, EC DMC) were prepared by UV polymerization. Electrolytes were optimized to achieve suitable ionic conductivity (up to 7.5 mS/cm) and good mechanical stability. The electrochemical stability up to 4 V was determined on stainless steel electrode by voltammetrical measurements. [3]

3. CONCLUSION

We are on beginning, however, we can say that Na-ion batteries one time will be work. We have developed gel electrolyte with acceptable values for commerce produced Li-on batteries. Next step we are going to do measurement of the gel electrolyte with Na ionts and we will continue the search for a suitable electrode mixture for storage Na ions.

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