The production of NaFePO4 Cathode material by Ion-exchange technique and the investigation of electrochemical analysis

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In this study, olivine-NaFePO4 was typical via organic-based electrochemical insertion of sodiums by electrochemically delighted and it was used two-step production procedure. First, delithiation of LiFePO4 in an organic lithium cell under high constant voltage and then the cathode were separated from the cell and inserted the cell assembled as Na/NaClO4 electrolyte/cathode. The cell was discharged at a lower voltage for several hours for insertion of Na in the FePO4 structure. Voltage-Time graphs of ion exchange procedure show the current change during to process and the change of the current for both processes is related to Li deinsertion from LiFePO4 and Na-insertion for FePO4 structure.

It was investigated the optimum voltage-time conditions for better electrochemical properties and we used 1-6 h for deinsertion of Li ions and 1-6 h for insertion of the Na-ions in the structure. The ion-exchanged NaFePO4 was used as a cathode material for CR2032 coin cells and The CV of the CR2032 coin cells was investigated for the voltage window of 2-4.3 V using a scan rate of 0.1 mV s–1 to the determination of anodic and cathodic reactions in the cells. The CV of LiFePO4 was seen in Figure 2 which is similar to the literature. After the ion-exchange procedure, the C graph shows the characteristic properties of NaFePO4 battery cells.

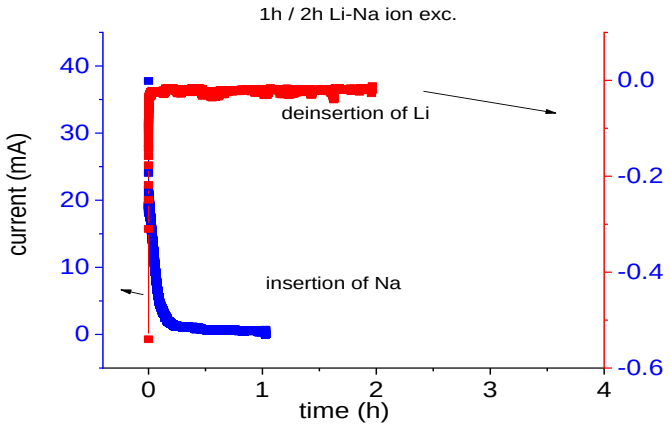


Fig.1. Voltage Time graph of ion-exchange procedure.

In a conclusion, we successfully achieved ion exchange using $LiFePO_4$ cathode materials by the chronoamperometry technique. The electrochemical analysis showed that the used method is useful for the production of $NaFePO_4$ cells.

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