Electrochemical Properties of Hybrid Supercapacitors Based on the Nanosized Spinel $LiMn_{1.95}Fe_{0.05}O_4$

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In recent years, hybrid supercapacitors are sharply developing. They are dominating over both the existing power sources and the symmetrical capacitors due to high power density and long cycling life. For today, the search of highly capacitive material for the anode supercapacitor is still continuing. This paper describes the use of spinel $LiMn_{1.95}Fe_{0.05}O_4$ as the anode material for supercapacitor.

This nanosized spinel was synthesized by sol-gel method. At the final stage of the synthesis the samples were annealed at the temperature of 873 and 1073 K. On its basis, anode mixture was formed (75% - spinel, 25% - carbon black). As cathode mixture was used the activated carbon and carbon black. Supercapacitor models in aqueous electrolyte 1M Li_2SO_4 discharged at the current of 10 mA in galvanostatic mode.

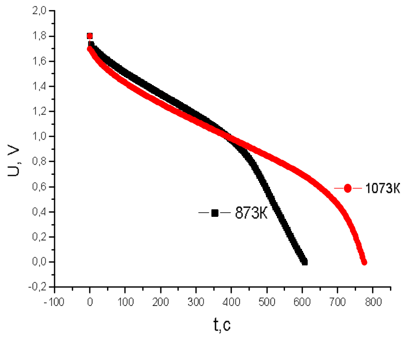

Fig. 1. Discharge curves of supercapacitor based on the spinel anode $LiMn_{1.95}Fe_{0.05}O_4$

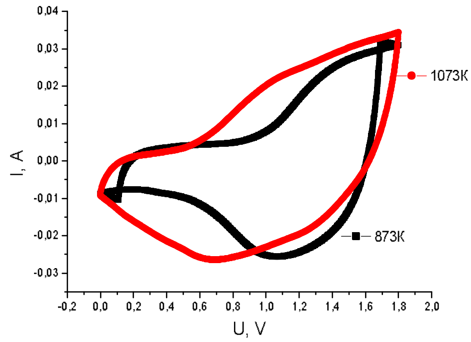

Fig. 2 CVA curves of supercapacitor anode based on the spinel $LiMn_{1.95}Fe_{0.05}O_4$

Discharge curves are characterized by slope in the voltage vicinity of 1.3V. The sample annealed at 1073K shows higher specific capacitance (14.4 mA • h / g) and longer discharge time. Results of galvanostatic experiments were confirmed by CVA method (scan rate of 5mV / s). Potentiodynamic curves have anodic peaks corresponded to lithium intercalation during discharge of supercapacitors (Fig. 2) Experimental data indicate that the investigated materials can be successfully used in the high capacity hybrid electrochemical systems