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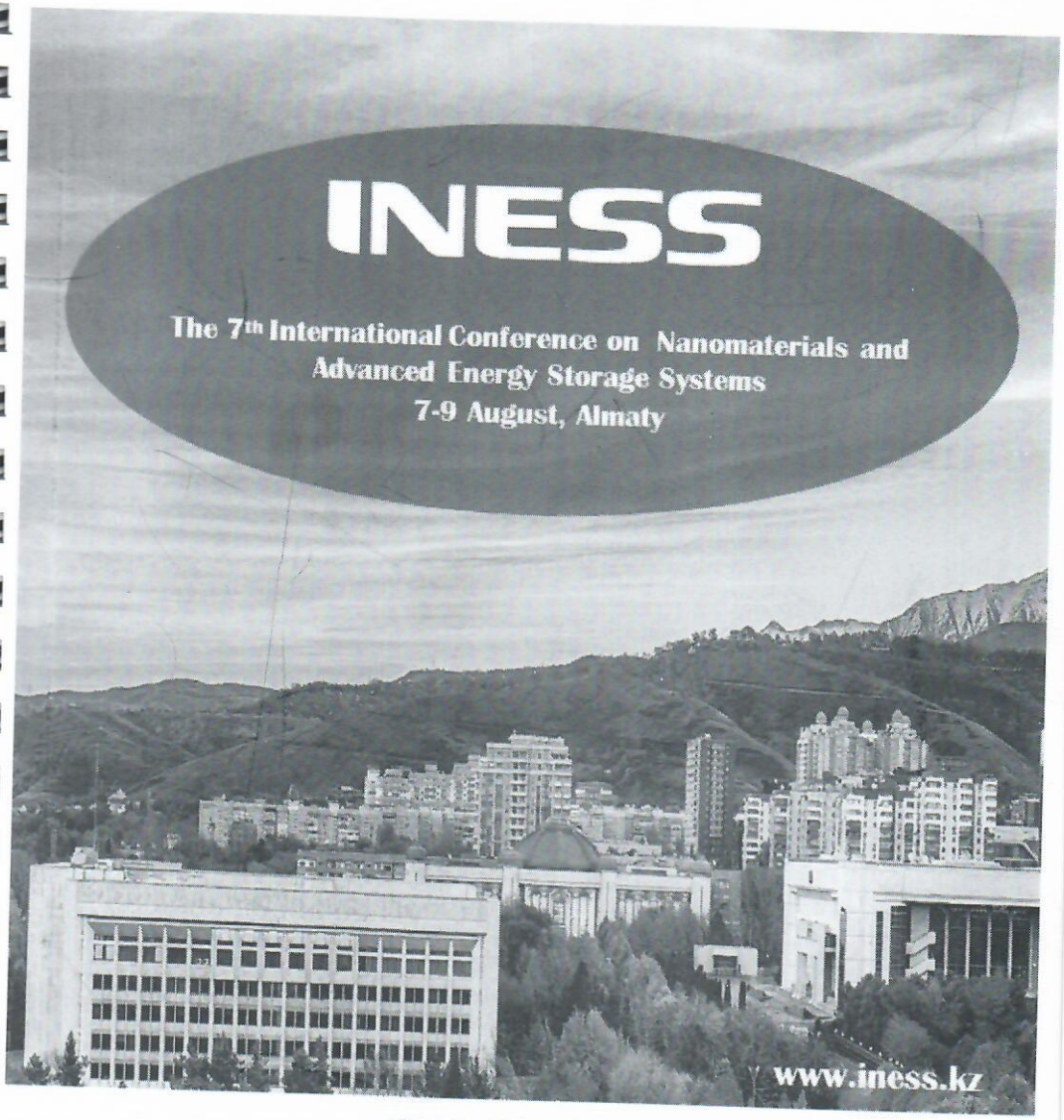
ABSTRACT BOOK



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CONTENT

Efficient way to create conductive coatings based on various carbon materials

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One of the promising candidates for the replacement of expensive lithium-ion batteries are sodium-ion batteries. The newest material $NaFe(SO_4)_2$ with an eldfellite-type structure can intercalate into itself not only sodium ions, but also lithium. However, among its shortcomings should be noted the lack of electronic conductivity. The purpose of this work is to increase the electrical conductivity of the cathode material $NaFe(SO_4)_2$ by creating coatings of carbon materials.

$NaFe(SO_4)_2$ was synthesized and kindly provided by a group of scientists led by Professor Slater P (University of Birmingham). The first method of producing a carbon coating is based on the joint annealing of $NaFe(SO_4)_2$, a solution of tar and stearic acid at 400 °C. The second method is based on dispersing the mixture of "$NaFe(SO_4)_2$:CarbonBlack" and "$NaFe(SO_4)_2$:Graphite" in a ball mill. The grinding was carried out at 400 ppm for 1, 2, 4, 6 hours. On the basis of the obtained homogenized mixture, electrodes were fabricated according to the standard procedure with the ratio of components "$NaFe(SO_4)_2$:C:PVdF" = "70:20:10" (mass%). Electrochemical tests were conducted in a three-electrode cell vs. $NaFe(SO_4)_2$ in electrolyte 1M $NaClO_4$ EC/DMC (1: 1) with an auxiliary platinum electrode.

According to the X-ray diffraction data during the annealing, decomposition of $NaFe(SO_4)_2$ occurred, therefore, the use of high temperatures when working with this material should be avoided. In the second method, according to the data of galvanostatic analysis, it was found that with an increase in grinding time from 1 to 4 hours, a regular decrease in the particle size of the mixture to 1 μm occurs, as well as an increase in the capacity of the composites. So, for cathode coatings based on a mixture with graphite, the capacity was increased 3.5 times (35 mAh/g), while the capacity for composites with soot was increased only 1.3 times (45 mAh/g) . During the six-hour grinding of mixtures, according to the X-ray diffraction data, the decomposition and reduction of the base material occur, as evidenced by a sharp drop in capacity to 25 (with CarbonBlack) and 16 mAh/g (with graphite). Conducting wet grinding in pre-dried N-methylpyrrolidone as a heat sink did not give positive results.

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