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New Generation of Tio_2 Electrode in Supercapacitor

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Extended Abstract

Today, when the whole world faces a growing shortage of energy, new energy and new energy materials are necessary [3]. With more use of renewable energy in power grids and electric vehicles, we have to implement a reliable storage system to increase system efficiency. Supercapacitors as short-term storage can be used in different applications, from the backup system for wind turbines to accelerator motivation in electric vehicles. In this kind of storage, we are looking for more energy to make them strong competitors with batteries [4]. Due to its unique physical and chemical properties, titanium has potential applications in supercapacitor fabrication. Recently nanotechnology and nanomaterials have opened new opportunities in battery and supercapacitor electrode fabrication. In this paper possibility of using high power laser pulses in electrode fabrication has been investigated via electrochemical and physical analysis, as TiO_2 has been proven to be a suitable material for the next generation of supercapacitor electrodes [1].

In general, increasing the porosity of the laser treated surfaces is the main reason for better absorption of positive and negative ions in the storage process and leads to electrochemical properties improvement. For comparison, in the experimental part, we used two different frequency values (600 and 1200 Hz) in laser running [5]. By analysing the data drawn from the electrochemical test, we show lower frequency of 600 kHz could give us better electrical properties. In table I, we show the comparison results of electrical properties in two frequencies.

From the presented results, it can be concluded that: (1) the capacitance of the TiO_2 nanomaterial electrode induced by laser pulses, increased by %38 compared with pure titanium electrode, (2) by decreasing the frequency of laser pulses from 1200 to 600 kHz, the electrochemical properties of the electrode have been improved [2]. Based on the experimental results in the present study, a new process to improve the electrode's surface porosity and the electrochemical property, has been developed by using a laser pulses as a new technique for electrode fabrication.

Table 1: Caption for table goes at the top.

Electrode Material	C_{sp} (mF/cm^2)	Ch/DisCh Retention (%)	CPE-P	CPE-T
Raw Titanium	1.70	63	0.76	7e-06
TiO_2 (f=600Hz)	6.91	81	0.73	8e-06
TiO_2 (f=1200Hz)	3.14	79	0.72	1.1e-05

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