

POTENTIOSTAT FOR CUSTOMISED SUPERCAPACITOR MEASUREMENTS

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A simple potentiostat ‘Cheapstat’ (from IO Rodeo, Pasadena, USA) was studied to be used as highly customizable tool in the electrical and electrochemical measurements of supercapacitors. The supercapacitors, also known as electric double-layer capacitors (EDLC), are promising electrostatic energy storage devices which have higher power densities and higher cycle life than batteries. The supercapacitors can also be manufactured from solely safe materials at low cost using solution processing techniques [1, 2]. Cheapstat is an open source open hardware potentiostat project conducted by UCSB [3]. Cheapstat in its published form has implemented functionality of square wave voltammetry (SWV), cyclic voltammetry (CV), constant voltage and constant current measurement on Atmel Xmega based programmable hardware. Cheapstat project has also implemented a java interface on a PC which can be used to study measurement results.

The aim of this study is to evaluate and quantify the potential of Cheapstat potentiostat for be used in the supercapacitor research work performed for example in Tampere University of Technology. Performed supercapacitor measurements vary depending on the goal, but typically some standardized methods, such as CV and galvanostatic discharge measurements [1], are used to determine for example capacitance and internal resistance. Some of the measurements are rather time consuming, for example CV cycling which is used for determining the reliability and effects that occur over the time. These measurements can take as long as weeks or months [4]. Therefore, the measurement equipment would be tied to this particular measurement for long periods of time and would not be usable for other use. To overcome this, a low cost potentiostat would be beneficial since the measurement equipment could be dedicated to the use for long periods of time.

In the preliminary evaluation it was found that in its published form ‘Cheapstat’ was not directly suitable for the planned supercapacitor measurement work. This was partly due to the implementation of the software but also limitations in the HW. Thus, significant modifications are required to the device hardware, software as well as the PC software interface.

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