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Influence of Yttrium Addition on the High Capacitance of ZrO2-SiO2 Nanocomposite Anodic Oxide Films

M. Ishizuka, E. Tsuji, Y. Aoki, A. Hyono, T. Ohtsuka, N. Sakaguchi, S. Nagata, H. Habazaki

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Having power and energy characteristics between batteries and conventional capacitors, electrochemical capacitors offer new opportunities in electrical engineering and a fertile ground for the development and refinement of new electrode materials. This chapter will begin by introducing the fundamentals of electrochemical double-layer capacitors and pseudocapacitors (Sect. 17.1). It will go on to describe the most commonly used methods (Sect. Testing Electrochemical Capacitors-Electrochemical Impedance Spectroscopy. This note describes electrochemical techniques for energy-storage devices. Electrochemical Impedance Spectroscopy. EIS is a widely used technique to investigate electrochemical systems. The advantage of EIS is that it is generally non-destructive to the investigated system. This enables the possibility for further electrochemical measurements and post-mortem investigations.
For electrochemical capacitors of the system carbon-carbon, in spite of the fact that the electrode body consists of conductive activated carbon, it is always necessary to use highly conducive additives, preferably those selected from the group of carbon materials. Electrochemical capacitors, also called supercapacitors, store energy using either ion adsorption (electrochemical double layer capacitors) or fast surface redox reactions (pseudo-capacitors). They can complement or replace batteries in electrical energy storage and harvesting applications, when high power delivery or uptake is needed. A notable improvement