ABSTRACT

In urge to cope up the need of the energy across the world the scientists are putting the utmost efforts to find materials for energy production. The discoveries related to the energy producing devices, undoubtedly, are of the most important materials in the current world. Say for example conversion of the sunlight energy into the electrical energy or any other form of the energy, similarly the other sources as fuels, water etc are of the similar importance in the energy harvesting mechanism. At the same time it is observe that, along with the research in finding new devices for the conversion of energy, one need to think of the how to store a energy that is produced in large scale. And thus, in an attempt to contribute some to this field of science an attempt is made to develop the materials, which will be useful for the storage of the energy. And also to make available the same stored energy with high efficiency for various purposes. And in this category of the energy storage devices the important one is the supercapacitor. Electrode materials which are developed for the supercapacitor are reported in this thesis. The focus is on supercapacitor study.

The mechanism of the pseudocapacitor type is well focused in this thesis. Specifically the materials used for the fabrication of the electrode materials are chosen from the oxides of the transition metal. The focus is given on the metals as the cobalt. The special properties of the transition metals are being taken in consideration to produce the electrode material. The focus is also given on the use of the various electrolytes for the purpose of the study of the supercapacitance properties. Here the environmental friendly approach of making use of the ionic liquids is mainly considered. The ionic liquids of the various types are tested and used as electrolytes in this study. Also KOH is also applied as the electrolyte.

This nanotubes cobalt oxide is being synthesized by the modified reflux condensation sol gel method. This oxide is used as the electrode in the study of the capacitance studies. The deposition of the film on the substrate is achieved and then the film was allowed to undergo the annealing treatment at five hundred degree temperature. Following the use of various physico-chemical characterization
technique, the deposited films were tested for the ability to show supercapacitance. The morphology such as the nanotubes, which was shown by the cobalt oxide proved to be responsible for the better supercapacitance. And the capacitance was observed to be 125.7 Fg⁻¹ in the presence of the KOH as electrolyte. In another attempt, the synthesized ionic liquid was 1-butyl-3-methylimidazolium Tetrafluoroborate, as an attempt to find a better electrolyte in the supercapacitance studies. The cobalt oxide electrode in presence of the ionic liquid electrolyte have shown the specific capacitance 70 Fg⁻¹ at scan rate of 20 mVs⁻¹.