

CED : « Sciences et Techniques de l'Ingénieur »

AVIS DE SOUTENANCE

Mr. Mohammad Said El Halimi

Présentera ses travaux de recherche en vue de l'obtention du
Doctorat en Sciences et Techniques

Intitulé de la thèse :

«Towards a Cheaper, Safer and Low Environmental Impact Materials for Energy Storage Devices: Natural Resources-Derived Carbon Based Electrodes and Aqueous Electrolytes for Supercapacitors»

<u>Date :</u>	<u>Saturday, December 17, 2022</u>
<u>Heure :</u>	<u>12:00 AM</u>
<u>Lieu :</u>	<u>Faculty of Sciences and Techniques, Tanger(Conférence room)</u>

Devant le jury :

Membres de jury

Pr, Amrani Mahacine	Faculty of Sciences and Techniques, Tanger	President Examiner
Pr, Saadoune Ismael	Faculty of Sciences and Techniques, Marrakech	Rapporteur
Pr, Draoui Khalid	Faculty of Sciences of Tétouan,	Rapporteur
Dr, Zanelli Alberto	The National Research Council of Italy, Institute of Organic Synthesis and Photoreactivity, Italy	Rapporteur
Pr Ballarin Barbara	University of Bologna, Italy	Examiner
Pr, Soavi Francesca	University of Bologna, Italy	Co-Supervisor
Pr, Chafik Tarik	Faculty of Sciences and Techniques, Tanger	Supervisor

ABSTRACT

The growing market of electrical cars, portable electronics, photovoltaic systems..etc. requires the development of efficient, low-cost, and low environmental impact energy storage devices (ESDs) including batteries and supercapacitors.. Due to their extended charge-discharge cycle, high specific capacitance, and power capabilities supercapacitors are considered among the most attractive ESDs. Over the last decade, research and development in supercapacitor technology has accelerated: thousands of articles have been published in the literature describing the electrochemical properties of the electrode materials and electrolyte in addition to separators and current collectors. Carbon-based supercapacitor electrodes materials have gained increasing attention due to their high specific surface area, good electrical conductivity, and excellent stability in harsh environments, as well as other characteristics. Recently, there has been a surge of interest in activated carbon derived from low-cost abundant sources such as biomass for supercapacitor electrode materials. Also, particular attention was given to a major challenging issue concerning the substitution of organic solutions currently used as electrolytes due of their highest electrochemical stability window even though their high cost, toxicity and flammability.

At this regard, the main objective of this thesis is to investigate the performances of supercapacitors using low cost abundant safe and low environmental impact materials for electrodes and electrolyte. Several prototypes were constructed and tested using natural resources through optimization of the preparation of appropriate carbon electrodes using agriculture by-products waste or coal (i.e. Argan shell or Anthracite from Jerrada). Such electrodes were tested using several electrolytes formulation (aqueous and water in salt electrolytes) benefiting their non-flammability, lower cost and environmental impact; the characteristics that provide a promising opportunity to design safer inexpensive and environmental friendly devices compared to organic electrolytes.

Keywords: Supercapacitor, Nanoporous activated carbon, argan shells, anthracite, aqueous electrolytes, ammonium acetate water in salt electrolyte