

# **V<sup>th</sup> International Conference on Oxide and Non-oxide Materials for Optoelectronics and Energy Applications**

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**Book of Abstracts**

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## Study on Electrochemical Properties of Porous Carbons on the Basis of Biomaterials as Electrodes in Symmetric Supercapacitors with Alkaline Electrolytes

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The supercapacitors are relatively new generation of energy storage devices. With much higher power density than lithium ion batteries and much larger energy density than conventional capacitors, they offer a promising approach to meeting the increasing power demands of energy storage systems.

The electrode material kind is one of the main factors which determine the supercapacitors' performance. Besides the large surface area, highly porous structure, good adsorption property, and high electrical conductivity, the carbon surface chemistry is very important factor to develop a device with high energy density.

The present work researches the relations between texture structure, functional groups and surface compositions of carbon electrodes, the electrolyte properties and their electrochemical performances in symmetric supercapacitors.

Two activated carbons (commercial products YP-50F and YP-80F, "Kuraray Europe" GmbH) obtained from coconuts used as raw materials are subject of this study. They are characterized structurally and morphologically, and tested as electrode materials for electrochemical supercapacitors applying XPS spectroscopy, SEM, BET and Böhm titration method and Barrett-Joyner-Halenda analysis in conjunction with charge/discharge galvanostatic experiments. The electrochemical tests are carried out in different alkaline electrolytes (6M KOH, 6M LiOH and 6M NaOH). To go inside into surface and bulk electrode changes during electrode cycling, the ex-situ XPS and SEM/EDS experiments are also conducted.

It is found that the content of acidic functional groups and AC microporous structure, as well the electrolyte conductivity and the adsorption of the electrolyte ions into electrode materials contribute greatly on charge storage behaviour of the electrodes in these systems. The observed results are discussed on the basis of electrode-electrolyte interaction. On one hand, the surface functional groups may improve the wettability between the electrolyte solution and the carbon surface. The availability of surface oxygen groups (especially the carbonyl groups) increases the capacitance through faradic process, offering an additional pseudo-capacitance, on the other. The electrolyte properties should also be taken into account.

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