بسم الله الرحمن الرحيم

شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

MONA MAGHRABY

شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
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تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

MONA MAGHRABY

Faculty of Engineering
Cairo University

Cairo University

Preparation of Carbonized Fibers for Producing Supercapacitor Electrode

By

Karim Mohamed Nabil Mohamed Ali Mahmoud

A Thesis submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the degree of

DOCTOR OF PHILOSOPHY
in
CHEMICAL ENGINEERING

Faculty of Engineering, Cairo University

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Under the Supervision of

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Title of Thesis:

Preparation of Carbonized Fibers for Producing Supercapacitor Electrode

Key Words: Textile-grade polyacrylonitrile fibers, thermal stabilization, carbon fibers, activated carbon fiber monolith, electrical double-layer supercapacitor electrode.

Summary:

The aim of this study was to produce carbonized fibers from Textile-grade polyacrylonitrile (PAN) fibers, as these fibers are relatively cheap and commercially available in the market. Random initial experiments revealed that it is possible to stabilize the raw PAN fibers thermally by dipping them in an aqueous solution of Borax before being heated in thermal stabilization furnace. The stabilized fibers were characterized in order to choose the optimum stabilization process. Then, the stabilized fibers were carbonized, the carbonized fibers produced were also, characterized in order to identify them. The obtained carbonized fibers had 88.5 % carbon content and a porous surface with 283 m^2/g specific surface area. As an application of the thermally stabilized fibers produced in this work, these fibers in combination with phenolic resin were employed in making activated carbon fibers monolith. That monolith was characterized for being used as a supercapacitor electrode. Results of analyses showed that the optimum monolith electrode has a specific capacity of 29 Farad/g, specific surface area of 486 m^2/g including a mixture of (micropores and mesopores) and the stability of the electrical resistivity over the temperature range [-130 to 80 ^oC].

Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

Name: Date: / /

Signature:

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