

Dedication

To my parents, brothers

To my teachers

&

To my friends

Acknowledgment

First and foremost I would like to express my great gratitude to my supervisors Dr. Rawia Abdelgani, and Prof. Dr. Mubarak Dirar Abdalla at the Physics Department, Faculty of Science, Sudan University of Science and Technology (SUST) who were generous with time and providing the needed advice, encouragement. Also I would like to extend my thanks to the Department of Physics, Faculty of Science, graduate college, and SUST. Special thanks to Mr.Hamza , Awad Alla and Abd Elsakhi for helping in experimental set up.

Finally, all of these would not be possible without my beloved parents who instilled in their children love and value from a young age and the encouragement of my brothers as well as numerous other people who have contributed in my success.

مستخلص البحث

حضرت عينات من سناج الكربون بحرق الخشب . وأخذت ثلاث عينات وتم معالجتها بالأحماض (HCL,HNO₃ and H₂SO₄:HNO₃mixture) وتركت عينة رابعة من غير معالجة . وقد تمت مقارنة الخصائص البصرية لها مع عينة مرجعية من انبوب الكربون النانوي متعدد الجدران . وتمت دراسة الخواص البصرية للعينات المحضرة باستخدام مطياف (UV/VIS) في مدى الطول الموجي (288 – 500) nm . وقد اتضح ان معامل الامتصاص يكون كبيرا لكل العينات مقارنة بالعينة المرجعية واعلى ما يكون بالنسبة للعينة المعالجة ب HCL . اما معامل الانكسار فهو أقل لكل العينات مقارنة مع العينة المرجعية في المدى (315-382 nm) وادنى قيمة هي للسناج المعالج ب HCL وقد وجد ان اقصى قيمة للموصلية الضوئية هي ($1.35 \times 10^{11} \text{ sec}^{-1}$) لكل العينات عند الطول الموجي 357 nm في حين كانت عند 336 nm للعينة المرجعية . هذه النتائج اتفقت مع العلاقات النظرية .

كما تمت دراسة الخواص البصرية لأربعة عينات من مسحوق مخلفات البترول الكربونية . وقد تمت مقارنتها بالعينة المرجعية . أحد هذه العينات تركت بدون معالجة في حين تمت معالجة العينات الثلاثة الأخرى بالأحماض (HCL,HNO₃ and H₂SO₄:HNO₃mixture) . هذه العينة المرجعية هي انبوب الكربون النانوي متعدد الجدران . حيث تمت دراسة الخواص البصرية للعينات المحفزة باستخدام جهاز مطياف (UV/VIS) في مدى الطول الموجي (288 – 500) nm ولوحظ أن أقصى موصلية قد انزاحت نحو الطول الموجي الكبير . حيث كان أقصى طول موجي 480 nm للعينة المعالجة ب HCL . أما معامل الامتصاص فهو اكبر ما يكون لعينة المعالجة ب H₂SO₄:HNO₃ مقارنة بالعينة المرجعية و الغير معالجة ' أما معامل الامتصاص للثلاثان الأخران فهما أقل من العينة الغير معالجة . فيما يخص معامل الانكسار فانه صغير لكل العينات عند قيم الاطوال الموجية الأقل من 485nm ' فيما عدا القيمة عند الطول الموجي 346 nm للعينة المرجعية حيث تكون القيمة أقل ما يمكن . اما قيم ثابت العزل الكهربائي (dielectric constant) صغيرة لكل العينات عند الاطوال موجية الاقل من 450 , الا ان القيم تكون اعلى للاطوال الموجية الاكبر من 490 للعينات المعالجة ب HCL,HNO₃ . وهذه تفيد في التطبيقات الالكترونية .

ويكون طيف النفاذية المتحصل من جهاز FTIR متسقا مع نظيره UV مما يؤكد صحة النتائج

Abstract

Sinag carbon samples were prepared from wooden burning. The Four samaples were made to treat three of them by using some acids .The treatment of the three samples was made by the acids (HCL,HNO₃ and H₂SO₄:HNO₃mixture) .One of them is untreated. The optical properties of these samples were compared with control Multi Wall Carbon Nanotube sample (MWCNT).The optical properties of the prepared samples have been investigated by UV/VIS spectrophotometer .The absorption was found to be in the wavelength range (288 – 500) nm. The absorption coefficient is maximum for all samples compared to control and is maximum for that treated with HCL. The refractive index is less than the control for all samples in the range (315-382 nm). The minimum value is for sinag treated by HCL. The maximum optical conductivity is $(1.35 \times 10^{11} \text{ sec}^{-1})$ for all samples at 357 nm, while it is at 336 nm for control. The results agree with theoretical relations.

The optical Properties of four samples that made from Waste Petroleum Coke Powder (WPCP) were discussed and compared with a control .One sample was left without treatment ,while three samples were treated by acids (HCL,HNO₃ and H₂SO₄:HNO₃mixtur The control is Multi Wall Carbon Nanotube sample (MWCNT). The optical characteristics of the prepared samples have been investigated by UV/Vis spectrophotometer in the wavelength range (288 – 500) nm. The maximum conductivity for all samples shift towards larger wave length ,where the maximum shift is at 480 nm for the sample treated with HCL .The absorption coefficient is larger compared to control and non treated one for samples treated with H₂SO₄:HNO₃, the other two have values less than non treated one .The refractive index is smaller for all samples at all values less than 485nm ,except at about 346 nm for (MWCNT) control sample ,where it has minimum value at this point .The dielectric constant is smaller for all samples for wave length values less than 450 nm ,however for more than 490nm samples treated with HNO₃ & HCL have larger values. This can be useful in electronic applications.

The transmission pattern obtained by FTIR resembles that of the UV pattern, which confirm our results.

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List of Notation and Abbreviation

LPCVD	Low Pressure Chemical Vapor Deposition System
SEM	Scanning Electron Microscope
CNTs	Carbon Nano-tubes
SWCNTs	Single Wall Carbon nanotubes
MWCNTs	Multi Wall Carbon nanotubes
CRT	Cathode Ray Tube.
Fe	Iron
Co	Cobalt
BWs	Band Widths
Units	
Nm	Nanometer = 10^{-9} m
μm	Micrometer = 10^{-6} m