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Optical, Electrical, Magnetic, and Structural Properties of Talha and Hashab Gum Doped with Iodine

الخصائص البصرية والكهربائية والمغناطيسية والتركيبية لصبغي الطلح والهشاب
المشوب باليود

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الآية

﴿وَيَرَى الَّذِينَ أُوتُوا الْعِلْمَ الَّذِي أُنزِلَ إِلَيْكَ مِنْ رَبِّكَ هُوَ الْحَقُّ وَيَهْدِي إِلَى صِرَاطٍ الْعَزِيزِ الْحَمِيدِ﴾

صدق الله العظيم

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Dedication

To my parents, my brothers and sisters, my husband and sons: Mohammed and Muzmil. To all who have been enlightening the way of my life, without them I could not be.

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First of all I should offer my thanks obedience and gratitude to Allah. Most gracious, most merciful from whom I receive guidance and help.

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Abstract

The aim of this work is to use Gum in solar cells and electronic circuits by doping it with suitable compounds to act as a semiconductor. This will minimize the cost of electronic circuits and solar cells.

Two cultivars of Gum (Talha and Hashab) were used in this study five samples from Talha Gum and other five samples from Hashab Gum were doped with iodine having concentrations (0.1, 0.2, 0.3, 0.4, 0.5 ppm) by thermo chemical method. The optical properties and band positions were studied using Ultraviolet –Visible (UV-VIS) spectroscopy and Fourier Transform Infrared (FTIR) Spectroscopy. The crystal parameters and the crystal nano sizes were studied using Scanning Electron Microscope (SEM) and X-Ray Diffraction (XRD).

Upon increasing iodine concentration to be (0.1, 0.2, 0.3, 0.4 and 0.5 ppm) the Talha nano crystal sizes decrease taking values (98.60 , 85.52, 69.28, 60.59, and 53.46 nm) .The Hashab nano crystal sizes decrease also with corresponding values (96.63 , 82.98, 76.41, 67.11, and 52.57 nm). The increase of iodine concentrations increases absorption also for both Talha and Hashab .For Talha the increase of iodine concentration decreases the energy gap to take the values (2.364, 2.356, 2.352, 2.345, and 2.339 eV).For Hashab the energy gap increases assuming the values (2.453, 2.467, 2.473, 2.482, and 2.493 eV).The results of FTIR Spectrometer shows the existence of nine chemical bonds in Talha and six in Hashab. The bonds O-H , H-O-H ,C-O and C=C are common in Talha and Hashab.

This explains that Talha Gum properties as semiconductor is better than Hashab Gum since its energy gap is narrower and can become narrower by doping.

المستخلص

يهدف هذا البحث لإستخدام الصمغ فى الخلايا الشمسية والدوائر الإلكترونية بتشويبها بمركبات مناسبة لتعمل كشبه موصل. هذا سيقفل تكلفة الدوائر الإلكترونية والخلايا الشمسية.

تم أستخدام صنفين من الصمغ (الطلح والهشاب) فى هذه الدراسة تم تحضير خمسة عينات من صمغ الطلح وخمسة عينات أخرى من صمغ الهشاب مشوبة بتراكيز مختلفة من اليود وهى (0.1 , 0.2 , 0.3 , 0.4 , 0.5 ppm) بطريقة الكيمياء الحرارية. وتمت دراسة الخواص الضوئية للعينات ومواضع الروابط بإستخدام مطيافية الأشعة البنفسجية والأشعة المرئية ومطيافية تحويل فورييه للإشعة تحت الحمراء. أما المعاملات البلورية والحجم البلوري النانوي فتمت دراستها بإستخدام المجهر الإلكتروني الماسح وجهاز حيود الأشعة السينية.

عند زيادة تراكيز اليود لتصبح (0.1 , 0.2 , 0.3 , 0.4 , 0.5 ppm) تتناقص أحجام بلورات الطلح النانوية لتصبح (98.60 , 85.52 , 69.28 , 60.59 , 5.346nm). كما تتناقص أيضا أحجام البلورات النانوية للهشاب لتصبح (96.63 , 82.98 , 76.41 , 67.11 , 5.257nm). تؤدي زيادة تراكيز اليود إلي زيادة الإمتصاص لكل من الطلح والهشاب. بالنسبة للطلح فإن زيادة تراكيز اليود تقلل فجوة الطاقة لتتخذ القيم (2.364 , 2.356 , 2.352 , 2.345 , 2.339 eV). بالنسبة للهشاب تزداد فجوة الطاقة لتتخذ القيم (2.453 , 2.467 , 2.473 , 2.482 , 2.493 eV). بينت نتائج مطيافية تحويل فورييه للإشعة تحت حمراء وجود تسعة روابط كيميائية فى الطلح وستة روابط فى الهشاب حيث تشترك روابط O-H و H-O-H و C-O و C=C فى الطلح والهشاب.

وهذا يوضح أن خواص صمغ الطلح كشبه موصل أفضل من خواص صمغ الهشاب لأن نطاق طاقته أضيق ويزداد ضيقا بالتشويب.

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