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Electrical conductivity of chlorophyll with polythiophene thin film as solar cell / Norsyahida Sulaiman.

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PERPUSTAKAAN SULTANAH NUR ZAHIRAH UMT

ELECTRICAL CONDUCTIVITY OF CHLOROPHYLL WITH
POLYTHIOPHENE THIN FILM AS SOLAR CELL

By:
Norsyahida Binti Sulaiman

“A thesis submitted in partial fulfillment of requirement for the award of the
degree of Bachelor of Applied Science (Physics, Electronic and
Instrumentation)”

DEPARTMENT OF PHYSICAL SCIENCES
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Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk:.....
ELECTRICAL CONDUCTIVITY OF CHLOROPHYLL WITH POLYTHIOPHENE
THIN FILM AS SOLAR CELL

oleh NORSYAHIDA BINTI SULAIMAN.....,no. matrik: UK 14319.....

telah diperiksa dan semua pembedaan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Fizik sebagai memenuhi sebahagian daripada keperluan memperoleh Ijazah Sarjana Muda Sains Gunaan (Fizik Elektronik & Instrumentasi), Fakulti Sains dan Teknologi, UMT.

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DECLARATION

I hereby declare that thesis entitled **ELECTRICAL CONDUCTIVITY OF CHLOROPHYLL WITH POLYTHIOPHENE THIN FILM AS SOLAR CELL** is the result of my own research except as cited in the references.

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ELECTRICAL CONDUCTIVITY OF CHLOROPHYLL WITH POLYTHIOPHENE THIN FILM AS SOLAR CELL

ABSTRACT

Polythiophene (PT) and Chlorophyll (CHLO) were organic materials. Polythiophene was the conducting polymer that can exhibit electronic properties such as organic solar cell which approach to those of some semiconductors. Chlorophyll was organic materials which can react as photo receptor. In this work, materials were deposited in bulk hetero-junction. Spin coating method was a technique that used to deposit the combination of PT and CHLO thin film on the Aurum (Au) layer where Au thin film would be prepared with three different ratio of 1:1, 1:5, 1:10 and reversed. The optical characterization of thin film was measured using UV-Visible Spectrophotometer to study the optical absorption and to calculate the energy gap of CHLO and PT and the combinations of them. Four Point Probe, Pyronometer Sensor with Data Logger were used to determine the film electrical properties. The electrical conductivity of the thin film with different ratio was measured in the dark and under the light. From the optical absorption study, the maximum wavelength of CHLO:PT thin film one peak. The value of energy gap of CHLO was 5.12 eV whereas PT was 3.78 eV. The energy band gap for the CHLO:PT thin film in ratio 1:1, 1:5, 1:10, 5:1 and 10:1 was 4.18 eV, 4.08 eV, 3.91 eV, 4.49 eV and 4.54 eV respectively. The conductivity of CHLO:PT/Au in the dark were in the ranges of 0.277 Sm^{-1} and 1.389 Sm^{-1} . While the conductivity of CHLO:PT/Au in different intensities of light were in the ranges of 0.154 Sm^{-1} and 2.218 Sm^{-1} . Therefore, 1:1 thin film was chosen because of the electrical conductivity exceeded the optimum rate value.

KEKONDUKSIAN ELEKTRIK BAGI FILEM NIPIS KLOORIFIL DENGAN POLITIOFENA SEBAGAI SEL SOLAR

ABSTRAK

Politiofena (PT) dan Klorofil (CHLO) adalah bahan organik. Politiofena adalah polimer pengalir elektrik yang boleh menunjukkan sifat elektronik contohnya seperti sel solar organik yang menghampiri sebahagian semikonduktor. Klorofil adalah bahan organik yang boleh bertindak sebagai perangsang cahaya. Dalam kajian ini, bahan-bahan ini dimendapkan dalam simpang *bulk hetero*. Kaedah penyalut berputar ialah teknik yang digunakan untuk memendapkan kombinasi antara filem nipis PT dan CHLO pada lapisan emas (Au) di mana filem nipis Au disediakan dengan tiga nisbah bahan yang berbeza iaitu 1:1, 1:5, 1:10 dan sebaliknya. Pencirian optik bagi filem nipis diukur menggunakan *UV-Visible Spectrophotometer* untuk mengkaji penyerapan optik dan menghitung jurang tenaga bagi CHLO dan PT serta kombinasi keduanya. Penduga empat titik, sensor *pyronometer* dengan *data logger* digunakan untuk menentukan pencirian elektrik filem nipis tersebut. Kekonduksian elektik bagi filem nipis ini dengan nisbah yang berbeza diukur dalam gelap dan di bawah cahaya. Daripada kajian penyerapan optik, panjang gelombang maksimum bagi filem nipis ini mempunyai dua puncak. Nilai jurang tenaga untuk CHLO adalah 5.12 eV manakala untuk PT adalah 3.78 eV. Jurang tenaga bagi filem nipis CHLO:PT dalam nisbah 1:1, 1:5, 1:10, 5:1 dan 10:1 adalah masing-masing 4.18 eV, 4.08 eV, 3.91 eV, 4.49 eV dan 4.54 eV. Kekonduksian bagi CHLO:PT/Au dalam gelap adalah dalam lingkungan 0.277 Sm^{-1} dan 1.389 Sm^{-1} . Sementara kekonduksian elektik bagi CHLO:PT/Au dalam keamatan cahaya yang berbeza adalah dalam julat 0.154 Sm^{-1} dan 2.218 Sm^{-1} . Oleh itu, filem nipis 1:1 dipilih adalah disebabkan kekonduksian elektrik yang telah mencapai kadar yang optimum.