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This thesis presents the classification of Agarwood from Malaysia and Indonesia regions based on signal processing technique. Signal processing for the Agarwood classification is a new area and has yet been actively implemented. In this thesis, the Agarwood has been pre-identified by experts using 32 sensor arrays to measure the Agarwood odor profile. General Agarwood pattern has been plot in 2D diagram. The odor profile from different samples have been normalized and pre-processed and visualized in 3D and 2D plot to find unique patterns. The variation of patterns that has been visualized has been marked as different group samples. From 32 data sensor arrays, several significant data sensor array have been pre-processed using principal component analysis (PCA) as data reduction process. The selected data from PCA are applied as...

Attention in incorporating inorganic nanostructures into organic optoelectronic devices has been growing in the past few years. These so-called hybrid organic-inorganic nanocomposites systems are being studied more closely due to its possibility in combining the advantageous characteristics of inorganic and organic components. Within a single composite, the properties can easily be changed or tuned by varying the size of nanoparticle, material composition, and concentration in the composites to match the device requirement. The most important thing, they can maintain the fabrication advantages of organic device such as easy processing, low production and material cost, and manufacturing the devices on large and flexible substrates. These are important in device application and commercialization. Therefore, research on improving the performance of organic solar cells by incorporating inorganic nanostructures in the organic materials has become important topic of research. The nanocomposited photoactive layer thin film which is MEH-PPV:MWCNT were prepared and characterized. The parameters that involved in the optimization are different composition of MWCNT in tetrahydrofuran (THF) and toluene, different composition of Iodine doped Multiwalled Carbon nanotubes (I-MWCNT) with low and high concentration of I-MWCNT. The characterizations involved are current-voltage (I-V), absorbance, transmittance and photoluminescence.

Essential oils (EO) is a substance extracted from a botanical material and always in high demanded. Steam distillation is a widespread method to isolate the essential oil from aromatic plants. The steam distillation method is most preferable due to factors of operational cost, cleanliness, system cost, high productivity and maintenance cost. However, some disadvantages of this method is loss of some volatile compounds, which will be diluted with boiling water within the distillation tank. The issue of steam distillation has not been given sufficient treatment in literature. The hydro-diffusion system was implemented as a viable alternative to overcome these setback. In the extraction process, the temperature will influence the final product of the extraction. The extraction temperature gives large effect on the percentage yield and quality of the oils. Almost all...
measurements and physical properties measurements which involved Field Emission Scanning Electron Microscopy (FESEM) and Atomic Force Microscopy (AFM). It was found that annealed MWCNT gave the best results in physical, electrical and optical properties. Meanwhile, comparing THF and toluene, THF convey the best results in all characterizations. The composition of I-MWCNT that was chosen to be used in organic solar cells was 60 wt% of I-MWCNT. In this work, bulk-heterojunction solar cells based on poly (2-methoxy-5-(2'-ethylhexyloxy)-p-phenylene vinylene) (MEH-PPV) and a highly conductive multiwalled carbon nanotubes (I-MWCNT) were fabricated and characterized by white light I-V and external quantum efficiency measurements. The influences of different temperature treatment of the nanocomposite layer, the various concentrations of iodine and different metal contact used as cathode on the solar cell device performance were studied. It was found that the optimized temperature occurred at 75°C with optimized iodine concentration of 1g. The best metal contact with high efficiency was given when Platinum (Pt) was used. The achieved highest short circuit current density and energy conversion efficiency is 0.052mA/cm² and 0.001%. Lastly, a new structure used Titanium dioxide (TiO₂) as n-type layer in organic solar cells was prepared. This layer act as hole blocking layer that prevents a direct contact between MEH-PPV:I-MWCNT and Indium Tin Oxide (ITO) substrates. The nanocomposited MEH-PPV:I-MWCNT with 60 wt% of I-MWCNT was prepared on ITO using Gold (Au) as the anode. It was found that interfacial area between MEH-PPV and TiO₂ has slight improved. Therefore, there is tendency to adapt device efficiency, short-circuit current (JSC), open-circuit voltage (VOC) and the fill factor (FF). The initial values for both short circuit current density and power conversion efficiency are 0.115006 mA/cm² and 0.414 x 10⁻³ % respectively.

Compounds of essential oils are unstable at high temperature and should be regulated below the saturated temperature throughout the extraction process. In order to regulate the temperature, a suitable controller is required. Three controllers namely PID, HFPID and STFPID are proposed and integrated to hydro-diffusion system to control the steam temperature. All developed controllers are expected to improve system performance in both transient and steady state dynamics. The ARX structure has been used to represent the system dynamic and successfully implemented in the simulation studies. Real-time implementation of the simulated controllers have been carried out on the real extraction process. The performance of the proposed controllers were evaluated. All the controllers have shown their ability to track the set point change and curb the disturbance in real-time. However, the STFPID with 5 membership controller is the most preferable, and demonstrated better performance compared to the HFPID and PID controller. By applying the proper temperature control during extraction process give better quality and preventing quality degradation of the essential oils.

And computation time. In addition, the comparison also has been made between single objective and multiobjective optimisation. On top of that, the multibjective QIEP is also applied to determine the optimal undervoltage load shedding (UVLS) in various loading conditions according to load profile with and without DG. From the analysis, it was found that the multibjective QIEP had yielded better optimal solutions and more consistent with faster convergence time as compared to other techniques. In order to ensure that the proposed technique is suitable for on-line application, a novel intelligent based technique is presented to predict the optimal output of DG and optimal undervoltage load shedding at various loading conditions. At this stage, a classical Artificial Neural Network (ANN) is developed using systematic training and testing procedures. Next, a novel hybrid Artificial Neural Network - Quantum-Inspired Evolutionary Programming (QIEP-ANN) is developed for comparison. Later, a Least-Squares Support Vector Machine (LS-SVM) model was developed using cross-validation technique. Finally, a novel hybrid Quantum-Inspired Evolutionary Programming - Least-Squares Support Vector Machine (QIEP-SVM) was presented. The results showed that the QIEP-SVM model had shown better prediction performance as compared to classical ANN, LS-SVM and QIEP-ANN.