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COMPARATIVE STUDY ON TREATMENT OF WASTEWATER USING NATURAL AND CHEMICAL COAGULANT : A REVIEW

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ABSTRACT-The community are facing a serious issue regarding water scarcity due to the exponential population growth. There are various type of wastewater treatment technologies have been developed to ensure plenty of water supply and to meet the demand of clean water for moving towards sustainable development. Coagulation and flocculation processes are the commonly used in a wide range of water treatment processes due to its simplicity and cost-effective approach. Chemical coagulants are commonly applied in the coagulation process for turbidity removal. However, it may leads to negative impacts toward health issues. Therefore, natural coagulants considered to be more environmentally friendly due to its biodegradability, renewability, non-toxicity and relative cost-effectiveness. This review paper was conducted to compare the effectiveness of natural coagulant versus chemical coagulant and to determine the mixing condition and settling time of the coagulant. This paper highlights the effectiveness of natural and chemical coagulants applied in different type of wastewater. The FTIR analysis proves the potential of natural coagulants in wastewater treatment due to presence of functional group such as carboxyl and hydroxyl group which could help in coagulation process. Generally, each of the application of coagulants in different type of wastewater have different type of mixing conditions. Based on the evaluation, most of the optimum mixing condition is around 100 rpm. The settling time for coagulation and flocculation show variation due to the different type of coagulants and wastewater. In general, it shows that the turbidity removal increases as the settling time increases. Based on the review, it can concluded the application of natural coagulants are feasible and reliable towards sustainable development.

KEYWORDS: *Wastewater. Coagulant; Settling time; Coagulation; Flocculation*

THE EFFECT OF HIDDEN LAYER, NEURON NUMBER AND ACTIVATION FUNCTION ON THE ARTIFICIAL NEURAL NETWORK ACCURACY ON REINFORCED CONCRETE SHEAR RESISTANCE PREDICTION

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ABSTRACT- Artificial Neural Network is widely used in the prediction of the shear resistance of fibre reinforced concrete beam. The process of optimizing this network for obtaining simple, yet global minimum error is of civil engineers interest. The work is focussed on a trial and error approach, on obtaining the optimal network for shear resistance prediction of fibre reinforced concrete beams, by selecting appropriate combination of hidden layer and its neuron numbers and activation function. The performance of each the networks will be studied in terms of Root Mean Square Error (RMSE). The final network, which is the most optimal one will be then validated with the testing and validation datasets to observe its prediction accuracy on the shear resistance.

KEYWORDS: Artificial Neural Network, Activation function, Hidden Layer, Neuron Number, Root Mean Square Error, Hyperparameters

THE TIME SERIES STUDY OF THE RAINFALL INTENSITY OVER PENANG ISLAND USING GIOVANNI SYSTEM

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ABSTRACT- Penang Island gets a tropical climate throughout the year. This means it is warm and humid through the year with variations in weather conditions. In this research, Penang Island is being selected as a study of area. On September and November, it is the wettest months with about 21 to 25 days of rainfall recorded in Penang. There are many bad effect if intensity of rainfall too high or too low such as flooding, landslide or insufficient water. GIOVANNI system is utilized to get the information from satellite where to empower Web-based visualization and investigation of satellite remotely detected meteorological, oceanographic, and hydrologic information sets, without users having to download data. By using GIOVANNI system method, the prediction for future event can be plot through the time series of rainfall where TOVAS is used as a sensor to measure the intensity of rainfall. The time series of rainfall can be plotted in daily, monthly or yearly depend on the study area and parameter has been choose. The main purpose of this research is to verify the reliability of the NASA GIOVANNI system to ensure the data has strong relation with real data from world weather. The result from GIOVANNI system is compared with world weather data in order to find out the resemblance of the data. Inequality of data between GIOVANNI and TOVAS are analyses by doing cross validation using regression analysis where R-square as an indicator to determine whether the relationship between both data are strong or weak. The results from this study shows, the R-square for the data 2016 and data 2017 are 0.4295 and 0.4743 respectively, where R-square is used to measures the strength relationship between GIOVANNI data and the WOLRD WEATHER.

KEYWORDS: *GIOVANNI system, WORLD WEATHER, regression analysis, time series, TOVAS*

THE STUDY OF INTERACTIONS BETWEEN MWCNTs-OH, MWCNTs-COOH AND MWCNTs-COCl WITH METHYLENE BLUE VIA DENSITY FUNCTIONAL THEORY

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ABSTRACT- The adsorption of multiwalled carbon nanotubes (MWCNTs) membrane onto methylene blue (MB) has been the latest technology in dye removal. However, the interaction between functional groups of MWCNTs with MB is still vaguely. The purpose of this study was to examine the interaction between selected functionalized MWCNTs with MB by using density functionalized theory (DFT) method. The calculation has been done through Gaussian 03W software packages. This method was used B3LYP with 6-31G(d) as a basis set for geometry optimizations. The selected functional groups of MWCNTs such as hydroxyl (-OH), carboxylic acid (-COOH) and acyl chloride (-COCl) were used in this study as they are common type of MWCNTs membrane. The B3LYP method with 6-31+G(d) basis set was used for energy calculations. As a result, the electronic properties of MB with MWCNTs-OH, MWCNTs-COOH and MWCNTs-COCl showed an electrostatic attraction and hydrogen bonding are the main interaction in the adsorption. The energy value showed that acyl chloride functional group has the lowest energy value followed by carboxylic acid and hydroxyl. However, the most polarity functional group was carboxylic acid. As a conclusion, the calculation by DFT method showed that a strong interaction between the membrane and MB can be a good dye removal technique.

KEYWORDS: methylene blue, density functional theory, adsorption, wastewater, dye removal

SAFETY PRACTICES ON WASTE DISPOSAL IN ACADEMIC LABORATORY AMONG LABORATORY STAFF

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ABSTRACT- Academic laboratories are considered as a potentially hazardous workplace. Several laboratory accidents have been reported worldwide in laboratories of higher education and research institution with catastrophic consequences. These laboratories accident may be caused from the use of various type of hazardous substance and material, improper disposal of laboratory waste, the use of specialized equipment, lack of safety compliance and poor safety culture. Therefore, safety practice and a strong safety culture must be of upmost importance in the academic laboratories among laboratory staff as failure in implementing safety could lead to injuries. Thus, this study aims to identify the safety practices of the laboratory staff in Universiti Teknologi MARA, Cawangan Pulau Pinang focusing on the waste disposal process in academic laboratory using laboratory safety questionnaire. The questionnaire was distributed online to staff working in the laboratory (N=50). The analysis was based on 23 item close-ended questionnaires grouped in the following categories: demographics (7), knowledge on waste management (3), laboratory waste management (5), laboratory safety practices (3) and personal protective equipment (PPE) and emergency responses (5) with a total of 50 respondents participated in this study. For self-perceived risk, only 44 % of the respondents felt that they are exposed to high and very high level of risk from the work conducted in the laboratory. It was found that the safety practices among laboratory staff focusing on waste disposal is satisfactory with evaluation conducted on knowledge on waste management, laboratory waste management, laboratory safety practices and PPE and emergency responses. However, the safety practices among laboratory staff could be further improved by ensuring all laboratory staff to attend safety training and to implement safety model comprising of safety culture and safety practices with the organizational commitment to create a safe workspace in the laboratory.

KEYWORDS: Safety, Practices; Waste Disposal; Academic Laboratory; Laboratory Staff



AUTOMATED MEASUREMENT OF SCREW THREAD USING MACHINE VISION WITH SUB-PIXEL EDGE DETECTION

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ABSTRACT- Production of threaded parts in today's industry requires high precision thread metrology. The traditional method of assessing the thread such as thread micrometer and screw pitch gages are considered subjective and less efficient in terms of inspection time. Thus, there is a need to implement an automated inspection system using machine vision to assess the mass quantity of threads to the highest accuracy. Thread parameters such as thread length, pitch, pitch diameter, minor diameter and major diameter were measured automatically and the screw thread profile was extracted from the scanned images using the sub-pixel edge detection. Extensive image processing algorithms were used to process and extract the data from the scanned images for measurement. The resultant measurement was compared to the existing methods using profile projector. The output of this work is beneficial to the quality inspection of thread manufacturing industry.

KEYWORDS: Measurement; Machine Vision; Edge Detection

FABRICATION OF HOMEMADE CHARCOAL BY A LOW COST METHOD

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ABSTRACT- Charcoal applications in everyday life, such as as a fuel for combustion, have piqued people's interest. Commercial charcoal, on the other hand, is typically produced by cutting down mangrove trees, which is not sustainable and reduces the natural barrier against erosion, storms, and floods. Hence, a new eco-friendly homemade charcoal was produced to replace the commercial charcoal. The new ChaCO-Ban material was produced by two-step conventional pyrolysis methods involving daily waste materials such as orange peels, banana peels and paddy husk. The scanning electron microscopy (SEM) images showed that the number of air cavities in the ChaCO-Ban sample is higher compared to the commercial charcoal. Samples with higher air cavity numbers are believed to produce more ignitions due to the higher oxygen levels around the sample. The energy dispersive X-Ray spectroscopy (EDS) results indicated higher ignition elements in the ChaCO-Ban sample compared with the commercial sample. The pH 7 of the ChaCO-Ban sample is neutral and safe.

KEYWORDS: Charcoal; Air Cavities; Waste Material; Pyrolysis; Chaco-Ban.

BIOLOGICAL SYNTHESIS OF SILVER NANOPARTICLES USING BEIJING GRASS EXTRACT AND THEIR TOXICITY EVALUATION

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ABSTRACT- Several types of metal nanoparticles have special properties are often utilized as one of the novel class of materials in the pharmaceutical industry and human health. Silver nanoparticles (AgNPs) have a unique structure which helps in antimicrobial action, environmental control, in therapist as well as device that are used in medical application. There is various type of method available to synthesis of AgNPs. In this study, Beijing grass extract (BGE) used to reduce and stabilize the silver ion in the formation of Beijing grass mediated-silver nanoparticles (BGM-AgNPs). The UV-Vis spectrophotometer was used to observe the formation of BGM-AgNPs based on their wavelength and absorption band. The effect of BGE concentration, volume ratio silver nitrate to BGE and toxicity effect of AgNPs were the main focus in this study. 100 % concentration of BGE and 5:5 volume ratio silver nitrate to BGE were the optimum value in the synthesis of BGM-AgNPs. The comparative of toxicity effect of AgNPs were also discussed in this study.

Keywords: *Silver nanoparticles; Silver nitrate; Beijing grass extract; Toxicity; UV-Vis.*