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Posters

Byung-Taek Oh et al., Ind Chem 2017, 3:2 (Suppl)
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Inactivation and degradation of antibiotic-resistant bacteria and its gene by Cu (II)/H_2O_2 system

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This study deals with the degradation and/or removal of antibiotic resistant bacteria (ARB) and antibiotic resistant gene (ARG) using Cu(II)/H_2O_2. The removal of ARB using Cu(II) was achieved, however, the inactivation capability was considerably improved when supplement with H_2O_2. The improved ARB inactivation was confirm by: (1) Addition of copper chelating agents, EDTA (for Cu(II)) and DMP (for Cu(I)) to block Cu(II)/Cu(I) redox cycle, (2) Addition of radical scavenger t-BuOH proving that ARB is mainly inactivated by Cu(III), and (3) Addition of H_2O_2 to produce Cu(I) and Cu(III). To investigate the cell destruction, PI staining was applied to check cell membrane integrity, and cell-permeability test to identify intra- and extra-cellular oxidative damage. In case of ARG inactivation, the efficiency was up to 5.5% when Cu(II) was treated alone, then it was improved up to 85% within 20 min when supplement with H_2O_2 in the reaction. Therefore, it is concluding that Cu (II)/H_2O_2 system is not only potential for inactivation of ARB but also inactivation of ARG under neutral pH condition.

Biography

Byung-Taek Oh is an Environmental Scientist, Author and Educator, who developed a new strategy in toxic pollutant remediation field. His expertise and contextual evaluation model based on responsive constructivists creates a new pathway for improving environmental pollution removal. He has framed a network in research to create a model to remediate microbes and toxic pollutant from environment has added a feather to his cap. He has built this model after years of experience in research, evaluation, teaching and administration both in laboratory and education institutions. The research foundation is based on his American carrier with network development and his excellence in environmental research by measurement, description and judgment. He has awarded with excellence in several aspects of research by his university and in several research occasions.

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Disha Soni, Ind Chem 2017, 3:2 (Suppl)
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Physicochemical analysis of bore-well water of Kheda district, Gujarat, India

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Study was conducted for the purpose of physicochemical analysis such as temperature, pH, dissolved oxygen (DO), total dissolved solids (TDS), electrical conductivity (EC), total alkalinity (TA), calcium hardness (CaH), magnesium hardness (MgH), chloride (Cl), sulphate (SO4-2), phosphate (po4-3) and nitrate (NO3-1) of water samples collected from bore-wells of 20 villages of Kheda district, Gujarat state, India. Quality of water is very important for different usages of water. Some villages were found to have maximum limit and minimum tolerance range for drinking water. The experimental values of water samples were compared with standard values given by World Health Organization (WHO) and Indian standards. The result concluded that, in some locations water quality was acceptable for drinking, domestic and irrigation purposes. In some of the locations, Phosphate parameters found higher than the prescribed values. The higher values of phosphates are mainly due to the use of fertilizers and pesticides used for the agriculture purpose. If phosphate is consumed in excess, phosphine gas is produced in gastrointestinal tract on reaction with gastric juice. Similarly, nitrate parameter is higher than the tolerance range in the bore-well water. In this study physicochemical analysis of bore-well water was carried out during 2015-2016 in order to assess water quality index.

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Water-saving eco-friendly cooling tower development and its performance evaluations

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There are some limitations about quantity of heavy metals in food and drugs especially in mineral water. High concentrations of heavy metals in food, drugs and mineral water can cause peripheral neuropathy, decrease in learning ability and memory, nephritis, anemia and growth deficiency during a long time. So everybody who drinks mineral water with lead content more than maximum contaminant level is high risk of lead cumulation and chronic toxicity by it. As there is not process control during mineral water production, we decided to assay lead quantity in products of 14 mineral water companies of IRAN, by atomic absorption spectroscopy. The maximum average of lead content (0.0935±0.0018 ppm) was found in crystal mineral water and the minimum average of lead content (0.0222±0.00099 ppm) in Sepidan mineral water. Results showed that the mean lead content, in 14 types of mineral water were higher than approvable concentrations(≤0.0015 ppm) so none of these samples had a satisfactory lead concentration.

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Water Hyacinth: from threat to value-added product via HTC

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Water Hyacinth (WH, Eichornia crassipes) is universally regarded as one of the more serious world's invasive plants. Native from the Amazon river basin and introduced as an ornamental plant for water gardens, its rapid spreading has made this plant to be a major weed in many areas such as southern US states from Florida to California. WH tends to form mats on the water surface and can quickly dominate aquatic systems because of fast growing rate. WH causes problems for humans (navigable waterways obstruction, hydroelectric device fouling, blocking of irrigation channels…) and ecosystems (significant deterioration of water quality and severe harm to wildlife). In this work WH (leaves and stem) were subjected to hydrothermal carbonization (HTC) under varying experimental conditions (temperature, time and biomass/water ratio). This process has proven to be a cost effective green route to produce carbonaceous materials and offers many advantages including the possibility of using high moisture materials. The resulting hydrochars were characterized in terms of solid yield (SY, %), Heating Value (HHV, MJ kg-1) and surface properties (porosity, surface morphology and functionalities). It was found that SYs were very low owing to the high moisture content of the biomass (>99%). In general, longer HTC times, lower temperatures and greater biomass loads (even without water addition) involved greater values of SY. Temperature had the highest influence on HTC reactivity, promoting numerous degradation reactions. N2 adsorption analyses at 77 K indicated that all HCs had an incipient porosity, mainly located in the mesopore range, with low values of SBET (20-45 m2 g-1). Moreover, microspheres were observed from SEM analyses, as a result of polymerization of cellulose degradation products. The investigation of this invasive specie is of high interest; these results suggest that WH might be investigated for biofuel applications as well as for other used in the materials field, such as adsorption, energy storage or soil remediation. We are grateful for financial support provided by the Ministry of Economy and Competitiveness (MINECO) via project CTM2016-75937-R

Biography

Silvia Román is associate professor at the University of Extremadura (Spain); her teaching includes subjects like technical thermodynamics and thermal engineering. Her research is focused on the use of wastes for energy via thermochemical processes as well as the production of porous materials for several applications. She has published more than 50 scientific papers on these topics and has patent on the production of activated carbon for radioiodine adsorption. During last years, she has been main the researcher of several funded projects on the hydrothermal conversion of biomass. She has recently been awarded with research and teaching recognition prizes such as "Excellence to young researcher career" and "teaching excellence", both given by the University of Extremadura.

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Microalgae nitrogen recovery using hydrothermal carbonization

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During last years, increasing concern on climate change has motivated the scientific community to find ways for carbon dioxide sequestration. In this frame, synthetic algae growth offers significant advantages, such as simplicity, fast growing rates, and potential for biodiesel production. Recently, the possibility of converting algae to other valuable products has also been studied; hydrothermal carbonization (HTC) offers many advantages over other thermochemical processes, because of its low cost, favorable energy balance, and does not require an expensive drying step. Several works have showed the potential of HTC for increasing the heating value of biomass; however, very few studies have been devoted to study how experimental conditions affect N fixation on the hydrochar (HC), which can be highly desirable for some applications, such as adsorption or production of electrode materials. Moreover, the migration of N to the liquid phase (LP) might also be interesting allowing its further use for algae growing. In this work, Microalgae Scenedesmus was chosen for study because of its outstanding ability to grow in variable culture media. The HTC process was conducted under different conditions (temperature, time and biomass loading), hydrochars with variable N content were obtained, and the chemical equilibria involved in the process were investigated. HPLC analyses on the LP allowed identifying numerous N containing species. The fate of other nutrients (P, K, Na, Ca & Mg) was also investigated. It was found that while temperature had a clear effect on solid yield, its effect on the HC composition depended on the other variables. In general, for shorter HTC times (5 h), higher temperatures enhanced protein hydrolysis and thus the migration of N to the liquid phase in the form of amino acids which were further decomposed to O and N-containing species (carboxylic and organic acids, amines and ammonia). For larger time periods (20 h) temperature only played a secondary role and N fixation on the HC was significantly reduced in relation to 5 h experiments. Biomass loading did not show a significant effect on N distribution.

Biography

Silvia Roman is an Associate Professor at the University of Extremadura, Spain. Her teaching includes subjects like technical thermodynamics and thermal engineering. Her research is focused on the use of wastes for energy via thermochemical processes as well as the production of porous materials for several applications. She has published more than 50 scientific papers on these topics and has patent on the production of activated carbon for radioiodine adsorption. During last years, she has been main researcher of several funded projects on the hydrothermal conversion of biomass. She has recently been awarded with research and teaching recognition prizes such as Excellence to Young Researcher Career and Teaching Excellence, by the University of Extremadura.

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Guyteau Bayard, Ind Chem 2017, 3:2 (Suppl)
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Other Seawater Desalination Method

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This method of desalination is based on the previous one, i.e. it applies the possibilities of the laws of inorganic chemistry precisely the laws of the precipitation to desalinate any water containing salt, with priority for seawater the most abundant source of water on our planet. It is good to remember that the industry always has used these laws for the preparation of certain compounds. As the above method, rather than consume energy such as reverse osmosis, distillation, electrodialysis, it requires no energy. On the contrary recycling products used delivers power.

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Hidouri Khaoula et al., Ind Chem 2017, 3:2 (Suppl)
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Modeling of temperature for Simple Solar Distiller Hybrid with Heat Pump (SSDHP)

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Finding solutions for the purification of sea water today admits a major necessity in all countries, especially the third world. The considerable increase in the population growth of all types of industry is thought to find high quality technology to produce drinking water. Two models can be used in this work: Simple solar still (SSD) and simple solar still coupled with heat pump. In this research, the productivity of water by SSD and SSDHP was determined by the orientation, the use of heat pump, the simple or double glass cover. The productivity can exceed 1.2 L/m²h for the SSDHP and 0.5 L/m²h for SSD model. The result of the global efficiency is determined which is 30% and 50% respectively for SSD and SSDHP. The internal efficiency attained is 35% for SSD and 60% for SSDHP. Convective heat coefficient can be determined, which is attained at 2.5 W/m²°C and 0.5 W/m²°C respectively for SSDHP and SSD models.

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Investigation of the efficiency of conventional water treatment processes for the elimination of TOC in Jalaliyeh water treatment plant, Tehran, Iran

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Background: The organic compounds presence in water is considered as a key resource for the formation of trihalomethanes (THMs) and mutagenic substances.

Objectives: The chief motivation behind the present investigation was to examine the efficiency of Jalaliyeh water treatment plant in removal of total organic carbon (TOC).

Method: The water samples including raw water, the effluent after accelerator and the effluent after filtration were taken during 6 months. Two days from each week were selected in each, of which three samples were taken from the three points mentioned above. In other words, 24 samples in each month and totally 144 samples were collected during the whole study period. The measurement of TOC was performed by means of spectrophotometer at a wavelength of 555 nm.

Results: When the input TOC was at its maximum value, TOC removal efficiency was about 80% which can be increased by augmentation of the amount of coagulant substance or use of coagulant aid. The removal efficiency was declined by decreasing the concentration of TOC input.

Conclusion: The accelerator had an acceptable efficiency for the elimination of TOC. The samples taken after rainy days showed an increased amount of input organic matter, especially TOC, into the treatment plant compared to the days without rainfall.

Biography

Ali Asghar Najafpoor has joined the University of Newcastle in July 2016 for sabbatical leave period. Prior to joining the University of Newcastle, he has worked as an Associate Professor of Environmental Health, Mashhad University of Medical Sciences, Iran. He is an innovative Researcher with a remarkably wide and in-depth knowledge of environmental pollution control and remediation. Research conducted by him and his colleagues have demonstrated that pollutants complexes and some sorbed pollutants are bioavailable and this work has major implications for the toxicity, risk assessment and remediation of pollution in environment.

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A Magdy et al., Ind Chem 2017, 3:2 (Suppl)
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Synthesis of Fe3O4/kaolin magnetic nano-composite and its application in wastewater treatment

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Fe3O4/kaolin magnetic nano-composites were prepared by chemical co-precipitation method. The nano-composites were characterized using various instrumental techniques including X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), Scanning Electron Microscopy (Sem), Transmission Electron Microscopy Analysis (Tem), Vibrating Sample Magnetometer (VSM) and N2 adsorption -desorption method. The prepared nano-composites were tested and evaluated as an adsorbent in the removal of the anionic C.I Direct Red 23 dye. The effect of contact time, initial dye concentration, adsorbent dose, temperature and initial pH of the solution on the adsorption process was studied. The experimental data was modeled by using different isotherms and the results showed that linearized Langmuir isotherm is applicable to the process demonstrating a favorable process. Kinetic models were tested and the obtained results fitted best the pseudo-second order model. The calculation of thermodynamic potential functions such as the changes in enthalpy, entropy, and Gibbs' free energy showed that the adsorption is a spontaneous process with an endothermic heat effect and entropy production.

Biography

A Magdy has received his Master of Science degree with honors in Chemical Engineering from Alexandria University, Egypt. He has his expertise in advanced techniques for water and wastewater treatment. His background was reinforced with his academic career in the Chemical Engineering Department at Alexandria University. In 2012, he was appointed as a Teaching Assistant at the Arab Academy for Science and Technology. His thesis focused on the discovery of new materials used for the adsorption of undesired pollutants present in wastewater. His present research is based on the utilization of cheap, readily available kaolin clay and the extraordinary characteristics of nano iron oxide particles to produce a novel composite which may be applied in the treatment of polluted wastewater that has threatening effect on human health and aquatic life.

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Kinetics and mechanism of sorption of Cr(VI) by nanoparticles of synthetic magnetite

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The results of investigation of kinetics and mechanism of sorption of chrome (VI) by nanoparticles of synthetic magnetite in a model solution are presented. The model solution contained 400 mg/l of Na2SO4 and 50 mg/l of Cr (VI) (in the form of potassium chromate). Investigations were carried out at different temperatures and pH of the model solution. Particles of magnetite had the average diameter 32 nm and the specific surface area 36.3 m2/g evaluated by BET method. It was found that at sorption of chrome (VI) by magnetite two processes simultaneously proceed: (1) Simple physical adsorption and (2) Chemical reaction of interaction of Cr(VI) with magnetite (the chemisorption). The parameters of these processes at different temperatures and initial pH of the model solution were defined. The chemical reaction of interaction of chrome (VI) with magnetite was described by equation of reaction of the first order related to concentration of Cr(VI) in solution. Established relations allow evaluating the amount of magnetite for removal of chrome (VI) from polluted natural waters and sewage. For verification of the established relations additional experiments for cleaning sewage of some enterprise of Sverdlovsk region (Russia) from Cr(VI) by magnetite were carried out. As a result satisfactory coincidence of experimental and theoretical data was found.

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Accepted Abstracts

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Synthesis of water treatment chemicals adaptable to rural clean and drinking water technology

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Statement of the Problem: A cross section of rural communities in Africa are plagued by diseases, many of which are water borne or attributable to the quality of drinking water accessible to such communities. Access to clean freshwater is very necessary to human life and for industries like steel, copper, food, paper and petroleum chemical or mineral processing industry. Due to its good solvent property, water tends to dissolve a broad spectrum of substances from the environment. These include toxins and toxicants emanating from various forms of domestic, agricultural, industrial and other anthropocentric activities including hazardous substances from natural phenomena like earthquakes and volcanic eruptions. Contaminated waters are highly undesirable as they constitute a significant source of disease and worldwide death. Polluted water usually contains organic matter such as hydrocarbons and their derivatives, inorganic matter such as clay, sand, acids and bases, heavy metals such Pb^{2+}, Cu^{2+}, Ni^{2+}, Al^{3+} and pathogenic microbes like *Vibro cholerae, Entamoeba histolytica and Salmonella* Typhi which are causative agents for water-borne diseases like cholera, dysentery and typhoid. Most rural communities in Africa including Cameroon cannot afford sophisticated water treatment systems and require cheap and simple operable techniques to treat water for domestic purposes and related uses. The goal of all water treatment technologies is to remove turbidity as well as chemical and pathogenic contaminants from water sources in the most affordable and expedient manner possible. The purpose of this study is to synthesize water treatment chemicals which can easily be adapted to domestic water treatment in rural community water systems in order to curb rampant spread of water borne diseases typical for rural communities in Africa. The water treatment chemical is environmentally friendly due to its propensity to biodegradation.

Materials & Methods: This bonafide water treatment chemical was produced from gum arabic and poly acryl amide through graft copolymerization using ceric ammonium nitrate as a catalyst for the reaction. Gum Arabic was purchased in powdered form which is the organic component of the product that confers biodegradable properties and acts as the back born for graft copolymerization. The graft copolymer was blended with *Moringa oleifera* seed extract which has antimicrobial activity.

Results: The results obtained showed that the percentage yield of the graft copolymer is a function of both the initiator and monomer concentrations. The grafted copolymer was characterized by IR spectroscopy. The IR spectral data for pure gum arabic and that of gum arabic-grafted polyacrylamide indicate that grafting actually occurred. The flocculation properties of the product were good.

Conclusion & Significance: The successful grafting of polyacrylamide onto gum arabic will enhance the search for materials transformation through chemical derivatization with attendant expansion of their spectra of application.

Recommendations: Recommendations are made for more research into the use of simple potent water treatment chemicals that will alleviate the plight of the rural populace with attendant amelioration of public health and economic advancement.

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Modified LD slag as low cost adsorbent for treatment of phenolic wastewater from steel plant

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Water pollution is a very serious environmental issue across the globe. Presence of phenol in water is one of the major reasons for water pollution due to its various harmful effects. Consumption of polluted water, mainly by phenol even at its low concentration is very dangerous to human body. It affects human body severely by causing damages to central nervous system, kidney, liver and pancreas etc. In this work, LD slag, a byproduct of steel making industries, has been modified as low cost adsorbent for removing phenol through adsorption. The modified LD slag has been prepared by acid treatment followed by microwave heating activation. Box Behnken design (BBD) in response surface methodology has been applied to understand the effect of operating variables e.g. acid concentration (0.2-1 N of HCl), microwave radiation time (2-10 minutes) and power (240-1200 W), in the modification of adsorbent for the adsorption of phenol and the effect of microwave radiation time and acid concentration. Optimum conditions of these significant parameters involved in preparation of modified LD slag are obtained through optimization with the help of Design Expert 7.0 software. The adsorbent has been characterized by using XRF technique, BET apparatus and SEM images. The BET surface area of the modified LD slag is obtained as 81.18 m2/g. Batch experiments for the adsorption study have been conducted at different temperatures (30 °C, 40 °C & 50 °C). Langmuir model fits the experimental data with the maximum adsorption uptake of phenol, onto modified LD slag, as 3.4 mg/g and at a pH value of 6. The adsorption kinetics is fitted well to pseudo-second-order model. Thermodynamic analysis proves that the adsorption process is spontaneous in nature and it is an enthalpy driven process (ΔH_0=-4.51 kJ/mol)

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Quality assessment of groundwater from Avenorfeme, Akatsi district, Ghana

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A holistic assessment of the quality of groundwater from the shallow unconfined aquifers of the Avenorfeme and surrounding villages in the Akatsi south district in the Volta region of Ghana has been conducted. A groundwater classification scheme has been developed for groundwater in the area using a robust water quality index (WQI) modified for the case of the study area. For calculating the WQI, pH, sodium, potassium, calcium, magnesium, bicarbonate, chloride, nitrate, sulfate, total dissolved solids, and fluorides have been considered. On the basis of the WQI so computed, groundwater fell within the excellent, good, poor and unsuitable for drinking categories. This study finds that the salinity of groundwater in the area is largely attributed to mineral weathering leading to evolution of predominantly intermediate to high salinity NaCl water types. On account of salinity hazard, most of the waters are not suitable for irrigation in the area. Based on total hardness, the groundwater in the area is permanently hard.

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Application of $FeCl_3$ and $Fe(OH)_3$ compounds for comprehensive silica removal facilitating zero liquid discharge in RO and IC waste water reuse

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Chemical mechanical planarization (CMP), used heavily in integrated circuit (IC) manufacture, generates copious amounts of waste water high in colloidal and reactive silica, which inhibits on-site reuse in cooling operations and ultra-pure water (UPW) production. Silica, when present in cooling water, can reach solubility limits via evaporation and form impervious scale on heat transfer surfaces that decreases efficiency. Silica in reverse osmosis feed-water inhibits aspirations for high rejection and zero liquid discharge (ZLD) due to scale formation. When subjected to RO at high rejection, silica forms difficult-to-remove scale on the membrane concentrate side in the form of glassy patches and communities of aggregate particles. Current methods for silica scale mitigation in industry include dosing with chemical anti scalents or complex operating schemes including ion exchange and large pH swings. This work evaluates the implementation of the common chemical coagulant, FeCl3 and highly insoluble Fe (OH)3 in the removal of silica by coagulation and adsorption mechanisms, respectively. FeCl3 was shown to be optimizable for silica colloid coagulation in CMP waste water via charge neutralization resulting in turbidity <10NTU. Adsorption of reactive silica on Fe (OH)3 using a sequencing batch reactor approach exhibited >90% silica removal for the first adsorption cycle, and increased utilization of adsorbent material for subsequent runs in both CMP waste water and RO concentrate.

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Allium cepa L. as an acid-base indicator

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In this study, a facile and environmentally friendly method was reported for manufacturing of natural acid-base indicator by preparing *Allium cepa* L. juice, which provided the anthocyanins pigment. The anthocyanins pigment was extracted via boiling process. In detailed, the *Allium cepa* L. was cut into small fragments. Then the small fragments of *Allium cepa* L. was boiled in distilled water in order to extract the anthocyanin pigment. This process was followed by the addition of different solutions of acidic solutions; base solution as well as neutral solution was added into separate test tubes filled with extraction of *Allium cepa* L. juice. The obtained *Allium cepa* L. juice was then used as the pigment for the acid-base indicator. The pH of the solution can be determined by observing the color change in the *Allium cepa* L. juice. The light purple color of the *Allium cepa* L. juice turned into red color when added with hydrochloric acid, its purplish color of the juice turned into yellow when added with sodium hydroxide, the original color of *Allium cepa* L. did not undergo any observable color change when distilled water is added into it. The *Allium cepa* L. exhibited excellent color change property with chemical solutions. These color changes make the *Allium cepa* L. be attractive for applications in acid-base indicators.

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High temperature H_2S adsorption using copper-titanate nanoparticles

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Direct desulfurization of syngas is an important measure to further increase the efficiency of IGCC systems. Solid-phase, metal oxide adsorbents which sequester the sulfur by converting H_2S to a metal sulfide are the only desulfurization technology capable of withstanding the combustion temperatures present at the outlet of the gasifier. Copper oxide is of particular interest due to its favorable thermodynamics across a wide range of temperatures. Cu-ETS-2 is a copper exchanged form of the sodium titanate ETS-2 and functions analogously to CuO for the conversion of H_2S into CuS at temperatures ranging from ambient to 950 °C. The results of this study show that Cu-ETS-2 is capable of removing H_2S from H_2S/He mixture to concentrations below a mass spectrometer's detection limit at temperatures as high as 950 °C. Temperature is, however, only one of the challenges facing a direct desulfurization adsorbent; high concentrations of H2 and water vapor are present in the syngas stream which can influence the oxidation state of the metal and the efficiency of H_2S removal. In an attempt to prevent reduction of CuO, chromium was successfully used to stabilize the oxidation state of copper oxide and maintain constant adsorption capacity throughout the whole temperature range. While several studies have examined the effect hydrogen in the feed, there are few studies exploring the influence of water vapor on the efficiency of H_2S removal and none that explore the effect of water vapor at elevated temperatures. This study can be considered the only study to investigate the influence of water vapor on the desulfurization of a dilute H_2S stream at temperatures between 350 and 950 °C using copper oxide-based adsorbents. The findings demonstrate that the presence of water vapor promotes production of H_2, resulting in faster reduction of CuO to Cu_2O and elemental copper, leading to less adsorption capacity. Finally, the ability of the adsorbent for regeneration and use as a multi-cycle adsorbent was investigated. The results indicate that the adsorbent is capable of regeneration for at least four times with no sign of reduction in capacity. The results also indicate that the exothermic nature of oxidation reaction results in temperatures up to ~1700 °C causing the partial melting of the quartz glass tube. However the adsorbent can withstand such high temperatures and does not lose adsorption capacity after the first oxidation step. This phenomenon is due to having nano titanate ETS-2 as the support in the adsorbent.

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Sorbent capacities and intensities of activated carbon from one-way thermochemical pyrolysis of palm nut shell for the removal of waste water dye stuff

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This paper presents evaluation of the feasibility of using palm nut shell activated carbon from one-way thermochemical pyrolysis and its adsorption properties for removal of industrial dye stuffs from waste water. The relationship between the ordinary (k_f), maximum (qm) and theoretical saturation capacities (q_D) were also investigated to follow the order; $q_m > q_D > k_f$. H_3PO_4 catalyzed sorbent dwell at a longer activation time. SS/A/15 -presented a higher adsorption capacities (q_m=6.024 mgg-1, q_D=4.189 mgg-1 and kf=0.628) and higher sorption intensity (1/n=0.714), than the other 3 series. The high % dye removal (%RE up to 84.80%) adsorption normalcy (1/n<1 and RL<1) and good applicability (R^2>0.869) are critical for considering palm nut shells as precursor for generating low cost active bio-sorbents.

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Cloning, characterization and saccharification analysis of GH12 endo-1, 4-β-glucanase from *Thermotoga petrophila* in a mesophilic host

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Production of bioethanol has received much attention in recent years and many countries have made large investments in infrastructure, process development and production facilities. Energy crisis are the leading economic constrains in developed as well as in developing countries. With the exhaustion of nonrenewable resources at an exponential rate, the need to develop alternative renewable sources which can be both cost effective, environmental friendly and high in yield is the need of time. Recently, the increasing demand of energy has strongly stimulated the research on conversion of lignocellulosic plant biomass by the action of cellulases enzymes into reducing sugars, for the subsequent production of bioethanol. Endoglucanases are mainly responsible for hydrolyzing the internal glycosidic bond to decrease the length of the cellulose chains. Obtaining efficient and thermostable endoglucanase has become the goal of much research worldwide. Therefore, our research work was focused to search for new resources of endoglucanases, which was thermostable and with high catalytic efficiency. The article focuses on the thermotolerant endo-1,4-β-glucanase gene, of *Thermotoga petrophila RKU-1*, was cloned and over-expressed in *E. coli* strain BL21 codon plus for its potential usage for the hydrolysis of lignocellulosic biomass and in different industrial applications. Thermostable endoglucanase can be used simultaneously and directly in the saccharification procedure without a pre-cooling process of biomass. Purified enzyme was optimally active with 530 Umg-1 of specific activity against CMC at pH 6.0 and 95 °C, which has exhibited a half- life ($t_{1/2}$) of 6.6 min even at temperature as high as 97 °C and stable up to 8 hours at 80 °C. The recombinant enzyme saccharified pre-treated wheat straw and baggase to 3.32% and 3.2%, respectively after 6 h incubation at 85 °C. Its thermostability, resistance to heavy metal ions and high specific activity make endoglucanase a potential and promising candidate for various industrial applications such as in textile industry (in bio stoning and bio finishing), in animal feed production, in processing of beer and fruit juice, in biomass hydrolysis (bioethanol production) and in plant oil, detergent, pulp and paper industry.

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Color gradation of substituted polyacetylenes: Molecular design, synthesis and characterization of their helical structures

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Main-chains in substituted polyacetylenes (SPAs) are twisted into a helical structure in order to avoid steric hindrances between neighboring side-chains. We have previously demonstrated that the color of SPAs having phenyl rings, called poly(arylacetylenes) (PAAs) strongly depended on molecular structure of the side-chains in their aromatic ring and on solvents used by the polymerization reaction. In this work, we focused on relationship between color of PAAs and their helical structures. Designed PAAs having phenyl or naphthyl rings were synthesized and characterized to elucidate precise helical structures containing degree of twist and distance of aromatic rings in side-chains.

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Removal of Cu^{2+} ions from aqueous solution using a naturally occurring Kenyan micaceous mineral

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Water pollution by chemicals is of great public concern. Improvements in the quality and availability of water are however possible at relatively low costs. The objective of this work was to test the efficacy and applicability of a micaceous mineral of Kenyan origin (herein referred to as Mica-K) in the removal of Cu^{2+} ions from water and wastewater systems. The adsorption of Cu^{2+} onto mica-K was found to be dependent on experimental conditions, particularly: Contact time, adsorbate concentration, pH, particle size, sorbent dose and temperature. The sorption pattern of Cu^{2+} ions onto mica-K followed Langmuir, Freundlich, and Dubinin-Kaganer-Radushkevich (DKR) isotherms with correlation factors and other parameters for the isotherms confirming good agreement between theoretical models and the experimental results. Positive but small enthalpy, (ΔH^o) value suggests that sorption of Cu^{2+} is endothermic and involves moderately weak bonding between the metal ions and mica-K. The entropy (ΔS^o) value is positive indicating that there are some structural changes at the solid-liquid interface and that metal ion adsorption is likely to occur spontaneously at normal and high temperatures. Negative values for the Gibbs free energy, ΔG^o, shows that the adsorption process is spontaneous in nature without any induction period and that the degree of spontaneity of the reaction increases with increase in temperature. Kinetic modeling analysis of the Elovich, pseudo-first order, pseudo-second order, intra-particle diffusion, mass transfer and intra-particle diffusivity equations using the linear coefficient of determination, R2 values showed that the pseudo-second order equation was the most appropriate model for the description of Cu^{2+} transport with chemical sorption as its rate limiting step. X-ray photoelectron spectroscopic (XPS) analysis for Cu^{2+} ion-equilibrated mica-K, demonstrated that Cu^{2+} containing nodules existed on the surface of the mineral. Mica-K adsorbent was compared well with a commercially available elgalite ion exchange resin from Elga Company UK, when used to treat real water samples from different sources within Kenya and industrial effluents.

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Application and comparison of analytical hierarchy process (AHP) and network methods in routing of pipeline water transmission system from Taleghan Dam to Hashtgerd New City, Tehran, Iran

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For determining the optimal route of the water pipeline, technical and engineering considerations, economic, environmental and techniques that need to be applied, to all parameters simultaneously, are considered. In this study, first of influential factors in determining the route; the conditions of topography (slope, altitude), vegetation, land use, population density, length of pipeline, river and road, areas and important areas, residential, environmentally sensitive areas and centers (religious-culture) were determined using the base map and extracting the locus of points of interest from Google Earth to take action field operations navigation and to harvest land navigation. Then the data layer related target parameters in were loaded in GIS and then, applying the specific weighting the cost of map production operations based on Analytical Hierarchy Process (AHP) rate, mix and ultimately the optimal route using the lowest cost algorithm is determined. Comparison determination of the optimal route using ArcGIS software and IDRISI shows that the two routes coincide and comparing the designed route in this study (from Taleghan Dam to Hashtgerd New City) with ABFA route indicates that the route is 5/6976 km shorter than the ABFA route; despite optimal route cost only apply to influence some of the layers of the ABFA route is more. Two routes were compared on the basis of total cost and comparing them indicates that the optimal route towards the ABFA route costs will be reduced by 14%. ABFA major additional cost route resulted more from intersection with the river and the road, passing through unauthorized areas, passing through different users with higher costs and ultimately increasing the pipeline.

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