Effects of Forming Temperature and Sintering Rate to the Final Properties of FeCuAl Powder Compacts Formed through Uniaxial Die Compaction Process

Md. Mujibur Rahman, Mohamad Ayub Ismail, Iis Sopyan, Hendri Yani Rahman

Abstract
This paper presents the outcomes of an experimental investigation on the effects of forming temperature and sintering schedule to the final characteristics of FeCuAl powder mass formed at different temperature and sintered at different schedule. A lab-scale uni-axial die compaction rig was designed and fabricated which enabled the compaction of powder mass at room temperature as well as elevated temperature. Iron (Fe) powder ASC 100.29 was mechanically mixed with other elemental powders, namely copper (Cu), and aluminum (Al) for 60 minutes and compacted at three different temperature, i.e., 30°C, 150°C, and 200°C by applying 425 MPa of simultaneous downward and upward axial loading to generate green compacts. The as-pressed samples were inspected visually and the defect-free green compacts were subsequently sintered in an argon gas fired furnace at 800°C for 60 min at three different heating/cooling rates, i.e., 5, 10, and 15°C/min, respectively. The sintered samples were then characterised for their physical, electrical, and mechanical properties. The microstructures of the sintered samples were also analysed. The results revealed that a forming temperature of 150°C and a sintering rate of 10°C/min could produce a product with better characteristics.
Preparation and Characterization of Jackfruit Seed Starch/Poly (Vinyl Alcohol) (PVA) Blend Film

Norshahida Sarifuddin, Nur'Aishah Ahmad Shahrim, Nur Najihah Solehah Abdul Rani, Hafizah Hanim Mohd Zaki, Ahmad Zahirani Ahmad Azhar

Abstract
In this study, jackfruit seed starch (JFSS)/poly (vinyl alcohol) (PVA) blend films were prepared using the solution casting method. The effect of varies starch content on the mechanical (tensile strength and elongation to break %) and physical properties of the tested films were investigated. The optimum tensile strength was obtained at 10.45 MPa when 4 wt% of starch added to the blend. But, decreasing trend of tensile strength was found upon increasing the amount of starch beyond 4 w% in starch/PVA blend films. Nevertheless, elongation at break decreases with the increase in starch content. The mechanical properties of the blend films are supported by the Field Emission Scanning Electron Microscopy (FESEM), in which the native JFSS granules are wetted by PVA continuous phase with good dispersion and less agglomeration. The incorporation of JFSS in PVA has also resulted the formation of hydrogen bond evidenced by Fourier Transform Infrared (FTIR). Additionally, the biodegradation rate of JFSS/PVA was evaluated through soil burial.
Paper ID: 009

Fabrication of silica ceramic membrane via sol-gel dip-coating method at different nitric acid amount

Farah Diana Mohd Daud, Nor Amyra Zulianey Kahlib, Maizirwan Mel Ahmad Zahirani Ahmad Azhar, Noor Azlina Hassan, Assayidatul Laila Nor Hairin

Abstract

Fabrication of silica ceramics via the sol-gel method has offered more advantages over other methods in the fabrication of ceramic membrane, such as simple operation, high purity homogeneous, well defined-structure and complex shapes of end products. This work presents the fabrication of silica ceramic membrane via sol-gel dip-coating methods by varying nitric acid amount. The nitric acid plays an important role as catalyst in fabrication reaction which involved hydrolysis and condensation process. The tubular ceramic support, used as the substrate, was dipped into the sol of Tetrethylorthosilicate (TEOS), distilled water and ethanol with the addition of nitric acid. The fabricated silica membrane was then characterized by (Field Emission Scanning Electron Microscope) FESEM and (Fourier transform infrared spectroscopy) FTIR to determine structural and chemical properties at different amount of acids. From the XRD analysis, the fabricated silica ceramic membrane showed the existence of silicate hydrate in the final product. FESEM images indicated that the silica ceramic membrane has been deposited on the tubular ceramic support as a substrate and penetrate into the pore walls. The intensity peak of FTIR decreased with increasing of amount of acids. Hence, the 8 ml of acid has demonstrated the appropriate amount of catalyst in fabricating good physical and chemical characteristic of silica ceramic membrane.
Paper ID: 010

Influence of Fiber Treatment on Dimensional Stabilities of Rattan Waste Composite Boards

Zuraida Ahmad, Insyirah Yahaya, Maisarah Tajuddin

Abstract
The main drawback of using natural fibers in composite boards is its hydrophilic properties which absorb a high volume of moisture. This results in low dimensional stability of the produced composite boards. Hence, the purpose of this study is to investigate the effects of fibers’ treatment processes of the rattan waste fibers on the dimensional stabilities of composite boards. The collected fibers underwent two types of retting processes, namely a water treatment and alkaline treatment retting processes; where the fibers were soaked in water and a 1% sodium hydroxide (NaOH) solution, respectively. The fibers were dried and mixed with poly(lactic) acid (PLA) pellets with ratio of 30% fibers: 70% matrix; before being fabricated into composite boards via a hot-pressing process and were labelled as RF/PLA, WRF/PLA, CRF/PLA for untreated rattan, rattan treated by water retting, rattan treated by chemical retting, respectively. The produced composite boards were cut and soaked in water for 24 hours for dimensional stability in terms of water absorption and thickness swelling tests. The results showed that WRF/PLA has the lowest water absorption (3.2%), and the CRF/PLA had the highest water absorption (23.2%). The thickness swelling showed a similar trend as water absorption. The presence of void contents and fibers damaged the insides of the boards, which contributed to low dimensional stabilities of the composite boards. It can be concluded that water retting facilitated in improving dimensional stability of the produced composite board.
Paper ID: 012
Effect of Compaction Pressure of Green Body and Heating Current on Photoluminescence Property of ZnO Crystal Grown by Electric Current Heating Method

M H Mazwir, H L Yee, S R Misskon, A G E Sutjipto, M A Jusoh, R Othman

Abstract
In this study, we reported the effect of applied compaction pressure on green body and electric current heating on ceramic bar on the ZnO crystal growth and its photoluminescence characteristic. Crystals grown on ZnO bar sintered by 1100 oC were mostly on (1 0 1) orientation. Sample with 3.0 ton and 3.0 A for applied pressure and current, respectively revealed the shortest photoluminescence (PL) wavelength of 409.5 nm with highest emission energy of 3.03 eV.
Paper ID: 013
The Role of Tin and Magnesium in Assisting Liquid Phase Sintering of Aluminum (Al)

Nur Ayuni Jamal, Farazila Yusof, Maizatulnisa Othman, Khalisanni Khalid, Muhamad Nazarudin Zakaria

Abstract
This study aims to investigate the effect of tin (Sn) and magnesium (Mg) on the sintering response of sintered Al. Although this topic has been extensively reported, details on the combined effect of Sn and Mg that function as sintering additives are still limited. The current study discusses the effect of the combined use of Sn and Mg to assist aluminium (Al) in liquid phase sintering via the powder metallurgy technique. The results demonstrated that the densities of sintered Al increased from 2.5397 to 2.575 g/cm3 as the Sn content increased from 1.5 to 2.5 wt. % respectively. Accordingly, the physical characteristics of sintered Al were transformed from black to silver, which confirmed the reduction in the oxygen content (oxide layer reduction) from 0.58 to 0.44 wt. % respectively. Additionally, the microstructure of the resultant sintered Al demonstrated that effective wetting by Sn addition was obtained at its maximum content of 2.5 wt. % with a greater micro pores reduction and better metallurgical bonding between Al particles. Therefore, the introduction of different Sn content, along with Mg element, was found to further improve the sintering response of the resultant sintered Al that consequently improved its densities and physical characteristics.
Experimental Study Of Low-Velocity Impact On Foam-Filled Kraft Paper Honeycomb Structure

Nurdina Abd Kadir, Yulfian Aminanda, Mohad Sultan Ibrahim Shaikh Dawood, Hanan Mokhtar

Abstract

Low-velocity impact tests of unfilled and foam-filled Kraft paper honeycomb are carried out to investigate the effect of foam, indenter size and location of indentation on maximum or peak force and energy absorption capability. In this study, three indenter sizes (10mm, 12mm, 15mm) and three different locations of indentation (vertical edge, double wall and single wall) were used and compared. The test results show that the foam is given a significant increment of peak force and specific energy absorption to the honeycomb structure subjected to indentation load. The peak force and energy absorption capability also effected by indenter size which due to the contact area of indentation. As for the location of indentation, vertical edge gives highest peak force and energy absorption by the fact that vertical edge is the intersection of three walls of honeycomb cell.
Paper ID: 015
Experimental Investigation of Minimum Quantity Lubrication in Meso-scale Milling with Varying Tool Diameter

Hanis Nabillah Syazani Harun, Mizan Qistina Mohd Yusof, Rubina Bahar

Abstract
Minimum quantity lubrication (MQL) is a method that uses a very small amount of liquid to reduce friction between cutting tool and work piece. The implementation of MQL machining has become a viable alternative to flood cooling machining and dry machining. The overall performance has been evaluated during meso-scale milling of mild steel using different diameter milling cutters. Experiments have been conducted under two different lubrication condition: dry and MQL with variable cutting parameters. The tool wear and its surface roughness, machined surfaces microstructure and surface roughness were observed for both conditions. It was found from the results that operations that MQL produced better results compared to dry machining. The 0.5mm tool has been selected as the most optimum tool diameter to be used with the lowest surface roughness as well as the least flank wear generation. For the workpiece, it was observed that the cutting temperature possesses crucial effect on the microstructure and the surface roughness of the machined surface and bigger diameter tool actually resulted in higher surface roughness. The poor conductivity of the cutting tool may be one of reasons behind.
Effect of Alkali treatments on physical and Mechanical strength of Pineapple leaf fibres

Mohammad Asim, Mohammad Jawaid, Kalina Abdan, Mohammad Nasir

Abstract
There are many eco-friendly natural fibres, wood fibre and non-wood fibres being used to develop bio composites. Natural fibres are eco-friendly, minimum cost, less density, good mechanical properties, sound absorber and carbon dioxide sequestration over synthetic fibres. Natural fibres extract from various sources such as leaves, fruit, grass and bast, which provide mechanical strength and stiffness of biocomposites in various applications. Several industrial crop are being grown to collect fibres, it strengthen the supply of natural fibre for renewable materials and bio-composites [1-3]. There are some common natural fibres like flex, hemp, jute, kenaf, bamboo, sisal, and cotton being use for biocomposite. Pineapple leaf fibres (PALF) are waste material from pineapple cultivation. Annually, these waste material are available as a renewable cheap and abundant in amount for industries and researches purpose. PALF is the composition of high content of cellulose (70–82%) which is very higher than other natural fibres like oil palm frond, coir, and banana stem fibres while arrangement of PALF is the same as in cotton (82.7%) [4]. Higher cellulosic content in PALF and its lower microfibrillar angle enhance the physical and mechanical strength of matrix reinforced biocomposites [5]. Many researchers [6-8] reported that some limitations of natural fibre reinforced thermoset/thermoplastics are natural fibre-matrix interfacial adhesion and hydrophilic nature of natural fibres. Lower fibre-matrix incompatibility effect the mechanical and physical strength of matrix reinforced composites and incapable to load transfer between fibre and matrix. There are various treatments to increase interfacial adhesion capacity and less hydrophilic nature of natural fibre to enhance to mechanical properties of biocomposites [9]. In this study, alkali, treatments have been used on PALF fibres with various concentrations and immersion of time to modify its surface for good interfacial bonding with matrix. The aim of these treatments is to optimise chemical treatment of these fibres to make affective matrix reinforced composites.
Paper ID: 019
Pressure Variation of Developed Lapping Tool on Surface Roughness

Ahmad kamal Hussain, KeeQuen Lee, Lwin Moe Aung, LitKen Tan, Hooi Siang Kang

Abstract
Improving the surface roughness is always one of the major concerns in the development of lapping process as high precision machining caters a great demand in manufacturing process. This paper aims to investigate the performance of a newly designed lapping tool in term of surface roughness. The lapping tool is tested for different pressure to identify the optimum working pressure for lapping process. The theoretical surface roughness is also calculated using Vickers Hardness. By comparing the theoretical and experimental values, the present study shows that the newly designed lapping tool is capable to produce finer surface roughness.
Paper ID: 020
Hardness and Adhesion Performances of Nanocoating on Carbon Steel

Noor Azlina Hassan, Norhasnidawani Johari, Norita Hassan

Abstract
Nanocoatings offer great potential for various applications due to their superior characteristics that are not typically found in conventional coatings. Over the past years nanotechnology has become more and more important in the development of coatings. The adhesion and hardness properties of coating affect material properties. This paper reviews ZnO-SiO2 as nanopowder in nano coating formulation as the agent for new and improved coating performances. Carbon steel on medium type used as common substrate in nanocoating industry.
Paper ID: 021
Physical properties of coir and pineapple leaf fibre reinforced polylactic acid hybrid composites

Ramengmawii Siakeng, Mohammad Jawaid, Hidayah Ariffin, Mohd Sapuan

Abstract
This study examined the physical behaviour of Coir/PALF/PLA composites. In this research, coconut coir fibres (CF) and pineapple leaves fibre (PALF) reinforced polylactic acid (PLA) hybrid composites were fabricated by hand lay-up process and hot press. The aim of this work is to do comparative study on density, water absorption (WA) and thickness swelling (TS) of untreated CF/PALF reinforced PLA composites and hybrid composites. The effect of different fibre ratios in hybridization on density, WA and TS of CF/PALF hybrid composites were also analyzed and C7P3 showed highest density while P30 had lowest. The results indicated that the density varies on different fibre ratio. WA and TS of CF/PALF composites and hybrid composites vary with fibres ratio and soaking duration. WA and TS of untreated CF/PALF hybrid composites were increased by increasing coir fibre ratio so, C30 showed highest WA and TS whereas P30 and C1P1 showed least WA and TS respectively apart from neat PLA.
Paper ID: 024
Assembly Meshing of Abrasive Waterjet Nozzle Erosion

Naqib Hakim Kamarudin, Mohd Azmir Mohd Azhari

Abstract
The erosion wear of the Abrasive Waterjet (AWJ) Machine nozzle wear was simulated using Computational Fluid Dynamics based software. Due to the impact velocity of water and the entrained abrasive particles within the nozzle, erosion of nozzle is inevitable and it is the most critical part in ensuring kerf quality of the AWJ machine. The Discrete Phase Method (DPM) was used to determine the erosion rate. Three assembly meshing method were used for the simulation which is the Quadrilateral, Tetrahedral and Cutcell. The simulated results indicated different accuracy and trend erosion with the experimental results.
Mechanical Performance of Porous Concrete Pavement Containing Nano Black Rice Husk Ash

Mohd Ibrahim Mohd Yusak, Ramadhansyah Putra Jaya, Mohd Rosli Hainin, Mohd Haziman Wan Ibrahim

Abstract
This paper presents an experimental research on the performance of nano black rice husk ash on the porous concrete pavement properties. The performance of the porous concrete pavement mixtures were investigated based on their compressive strength, flexural strength, and splitting tensile strength. The results indicated that using nano material from black rice husk ash improved the mechanical properties of porous concrete pavement. In addition, the result of compressive, flexural, and splitting tensile strength was increases with increasing in curing age. Finally, porous concrete pavement with 10% replacement levels exhibited excellent performance with good strength.
Paper ID: 026
Thermal Properties of Durian Skin Fibre Nanocomposite Reinforced Polypropylene

Siti Nur E'zzati Mohd Apandi, Hazleen Anuar, Siti Munirah Salimah Abd. Rashid

Abstract
This paper report on the development of composite based natural fiber to reduce the reliance on petroleum based product in order to amplify the environmental awareness. The production of Durian Skin Nanofiber (DSNF) was conducted using biological fermentation method via rhizopus oryzae in order to obtain the nano dimension of the particle size. Polypropylene (PP) and DSNF were produced using Haake internal mixer via melt blending technique. The significance effect of maleic anhydride grafted polypropylene (MAPP) on the properties of PP/DSNF nanocomposite was conducted to study its thermal stability via thermogravimetric (TGA) and differential scanning analysis (DSC). The addition of MAPP increase the thermal stability of PP/DSNF nanocomposite where the char residue increase by 52%. Besides, the thermal degradation of PP/DSNF and PP/DSNF-MAPP is higher than PP where it exerts higher amount of weight loss at elevated temperature. The percentages crystallinity, %Xc of PP nanocomposites improves with the addition of MAPP based on differential scanning calorimetry (DSC) result by 35%.
Nitride Alloy Layer Formation of Duplex Stainless Steel Using Nitriding Process

M A Maleque, P H Lailatul, A A Fathaen, K Norinsan, J Haider

Abstract
Duplex stainless steel (DSS) shows a good corrosion resistance as well as the mechanical properties. However, DSS performance decrease as it works under aggressive environment and at high temperature. At the mentioned environment, the DSS become susceptible to wear failure. Surface modification is the favourable technique to widen the application of duplex stainless steel and improve the wear resistance and its hardness properties. Therefore, the main aim of this work is to nitride alloy layer on the surface of duplex stainless steel by the nitriding process under different process parameters using a horizontal tube furnace. There were 8 runs that undergone the nitriding process with different parameters of temperature, time and ammonia composition. The secondary electron microscopy and x-ray diffraction analyzer are used to analyse the morphology, composition and the nitrided alloy layer for treated DSS. The micro hardness Vickers tester was used to measure hardness on cross-sectional area of nitrided DSS. It can be concluded that nitride alloy layer can be produced via nitriding process using tube furnace with significant improvement of microstructural and hardness properties.
Paper ID: 028
An Integrated Approach for Facilities planning by Electre Method

Elhasan M.Y. Elbishari, Muataz Hazza Faizi AL Hazza, Erry Y. T. Adesta, Nur Salihah Binti Abdul Rahman

Abstract
Facility planning is concerned with the design, layout, and accommodation of people, machines and activities of a system. Most of the researchers try to investigate the production area layout and the related facilities. However, few of them try to investigate the relationship between the production space and its relationship with service departments. The aim of this research to is to integrate different approaches in order to evaluate, analyse and select the best facilities planning method that able to explain the relationship between the production area and other supporting departments and its effect on human efforts. To achieve the objective of this research two different approaches have been integrated: Apple’s layout procedure as one of the effective tools in planning factories, ELECTRE method as one of the Multi Criteria Decision Making methods (MCDM) to minimize the risk of getting poor facilities planning. Dalia industries have been selected as a case study to implement our integration the factory have been divided two main different area: the whole facility (layout A), and the manufacturing area (layout B). This article will be concerned with the manufacturing area layout (Layout B). After analysing the data gathered, the manufacturing area was divided into 10 activities. There are five factors that the alternative were compared upon which are: Inter department satisfactory level, total distance travelled for workers, total distance travelled for the product, total time travelled for the workers, and total time travelled for the product. Three different layout alternatives have been developed in addition to the original layouts. Apple’s layout procedure was used to study and evaluate the different alternatives layouts, the study and evaluation of the layouts was done by calculating scores for each of the factors. After obtaining the scores from evaluating the layouts, ELECTRE method was used to compare the proposed alternatives with each other and with the existing layout; ELECTRE compares the alternatives based on their concordance and discordance indices. The alternatives were ranked from best to worst where regarding to the layouts concerned with the manufacturing area B.4 is the best alternative
Paper ID: 030
Statistical Analysis Study of Tensile Test Data for Open-Cell Aluminium Foam Sandwich

Muataz Hazza F. Al Hazza, Nur Asmawiyah Binti Ibrahim, Erry Y T Adesta, Atiah Bt. Abdullah Sidek

Abstract
Aluminium foam sandwich (AFS) panels are one of the growing material in the various industries because of its lightweight behavior. AFS is also known for having excellent stiffness to weight ratio and high-energy absorption. Due to their advantages, many researchers’ shows an interest in aluminium foam material for expand the use of foam structure. However, there is still a gap need to be fill in order to develop more reliable data on mechanical behavior of AFS with different parameters and analysis method approach. This research was conducted by using aluminium foam core grade 6101 with aluminium sheets skin tested under tension. The extract data is analyzed using JMP statistical analysis software (version 11). Results found that, skins thickness gives a significant impact to stress/strain value compared to core thickness.
Paper ID: 031
Effect of Solvents on the Morphology and Performance of Polyethersulfone (PES) Polymeric Membranes Material for CO₂/CH₄ Separation

Muhammad Shahidi Bin Ahmad, Dzeti Farhah Mohshim, Rizwan Nasir, Hafiz Abdul Mannan, Hilmi Mukhtar

Abstract
Membrane technology has several advantages such as the ability to separate chemical species within compact plant footprints, low thermal energy requirements and simple process flow schemes. By optimizing the available materials and analysis, this project work comes with the objective to synthesize the polymeric membrane, which has the best separation performance. In this project work, three (03) membranes have been synthesized and a comparative analysis were conducted based on different types of solvent namely N, N-dimethylacetamide (DMAc), N,N-dimethylformamide (DMF), N-methyl-2-pyrrolidinone (NMP). In characterizing the synthesized membrane, Thermo Gravimetric Analysis (TGA), Field Emission Scanning Electron Microscopy (FESEM) and Fourier Transform Infrared Spectroscopy (FTIR) analysis were used. A comparative study was carried out to compare the effects of each solvent towards CO₂ separation performance.
Paper ID: 032

Finite Element Analysis On Deformation Of Stretchable Electronic Interconnect Substrate Using Polydimethylsiloxanes (Pdms)

M.Faez Roslan, Norhashimah Mohd Shaffiar, Nor Khairussihima M.K., Sharifah I.S.S

Abstract

Over the years, the technology of electronic industry has growth tremendously. Open ended research on how to make a better concept of electronic circuit is ongoing especially on the stretchable electronic devices. There are many designs to achieve stretchability in electronic circuits. The problem occurs when deformation applied to the stretchable electronic circuit, it cannot maintain its functionality. Fracture may happen on the conductor. In this research, the study on deformation of stretchable electronic interconnects substrate using Polydimethlysiloxanes is carried out. The purpose of this research are to study the axial deformation occur, to determine the optimum shape of the conductor designs (horseshoe, rectangular and u-shape design) for the stretchable electronic interconnect and to compare the mechanical properties of Polydimethlysiloxanes (PDMS) with Polyurethane (PU) using Finite Element Analysis (FEA). The simulation was done on the FE model of the stretchable circuit with dimension of 2.4 X 2.4 X 0.5 mm. The stretching of the FE model was simulated with the range of elongation at 10, 20 and 30 percent from its original length in order to find the strain value for all three of the conductor designs. The best conductor design is used to simulate with different types of substrate (PDMS and PU). From the simulation result, Horseshoe design record the lowest strain value for each elongation, followed by rectangular and U-shape design. Thus, Horseshoe is considered as the optimum design for the conductor compared to the other two designs. From the result also, it shows that PDMS substrate will offer more maximum allowable stretchability compared to PU substrates. Thus PDMS is considered as a better substrate compare to PU. PDMS is a good material to replace PU since it can perform under tension much better mechanically.
Paper ID: 033
Machinability study of soda lime glass in high speed end milling

Mohamed Konneh, Mst. Nasima Bagum, Mohammad Yeakub Ali

Abstract
Ductile regime machining can produce crack free surface on brittle material under certain controlled cutting conditions. Although end milling is a versatile process, it is not been applied frequently for machining soda lime glass. The brittle nature of the soda lime glass makes the machining difficult. Soda lime glass is a strain rate and temperature sensitive material. Therefore, high speed machining can be beneficiary to achieve ductile surface with low roughness. Hence, proper combination of cutting parameters needs to identify. In this paper, the effects of cutting parameters such as spindle speed, feed rate and depth cut on the surface roughness parameters Ra, Rq and Rt are investigated to assess machinability of soda lime glass during high-speed end milling. Regression models are generated and process parameters are optimized using the Central Composite Design (CCD) of Response Surface Methodology (RSM). The uncoated tungsten carbide tool was used to conduct milling operation. Experimental verification of optimal condition, spindle speed 40,000 rpm, feed rate 10 mm/min and depth of cut 34 µm confirmed that ductile surface with Ra, Rq and Rt is 0.33µm, 0.49µm and 6.59 µm respectively possible to achieve.
Abstract
Soda lime glass has application in DNA arrays and lab on chip manufacturing. Although investigation revealed that machining of such brittle material is possible using ductile mode under controlled cutting parameters and tool geometry, it remains a challenging task. Furthermore, ability of ductile machining is usually assessed through machined surface texture examination. Soda lime glass is a strain rate and temperature sensitive material. Hence, influence on attainment of ductile surface due to adiabatic heat generated during high speed end milling using uncoated tungsten carbide tool is investigated in this research. Experimental runs were designed using central composite design (CCD), taking spindle speed, feed rate and depth of cut as input variables and tool-chip contact point temperature (Tc) and the surface roughness (Rt) as responses. Along with machined surface texture, Rt and chip morphology was examined to assess machinability of soda lime glass. The relation between Tc and chip morphology was examined. Investigation shows that around glass transition temperature (Tg) ductile chip produced and subsequently clean and ductile final machined surface is produced.
Abstract
In glass, machining crack free surface is required in biomedical and optical industry. Ductile mode machining allows materials removal from brittle materials in a ductile manner rather than by brittle fracture. Although end milling is a versatile process, it has not been applied frequently for machining soda lime glass. Soda lime glass is a strain rate and temperature sensitive material; especially around glass transition temperature $T_g$, ductility increased and strength decreased. Hence, it is envisaged that the generated temperature by high-speed end milling (HSEM) could be brought close to the glass transition temperature, which promote ductile machining. In this research, the objective is to investigate the effect of high speed machining parameters on generated temperature. The cutting parameters were optimized to generate temperature around glass transition temperature of soda lime using response surface methodology (RSM). Result showed that the most influencing process parameter is feed rate followed by spindle speed and depth of cut to generate temperature. Confirmation test showed that combination of spindle speed 30,173 rpm, feed rate 13.2 mm/min and depth of cut 37.68 µm generate 635°C, hence ductile chip removal with machined surface $Ra$ 0.358 µm was possible to achieve.
Tool wear mechanisms during cutting of soda lime glass

Mohamed Konneh, Mst. Nasima Bagum, Mohammad Yeakub Ali, Tasnim Firdaus Bt. Mohamed Arif

Abstract
Soda lime glass milling has high performance application. It is a challenging task to achieve fracture free surface on the same due to its brittle nature. High-speed end milling is capable to achieve ductile mode in an enhance flexibility. In this research, uncoated carbide tool was used to perform end milling of soda lime where spindle speed varied from 20,000 to 40,000 rpm, cutting depth from 10 to 30 µm and feed rate from 5 to 20 mm/min in dry condition. The effect of cutting parameters of tool flank wear and wear mechanisms were investigated. Investigation showed that Feed per edge has most influencing effect followed by cutting speed and depth of cut on flank wear and the main wear mechanism is abrasion wear. Also in some case oxidation, thermal diffusion and recast layer formed.
Electrostatic Discharge (ESD) Dust Removal and Neutralization Using The Air Ionizer for Polymer Material Application in Automotive Industry

Muhammad hafizan yosri, Pauziah Muhamad, Norfazrina Hayati Mohd Yatim, Mohamad Amiruddin Ismail

Abstract
Dust and fibre have been identified among the highest contributor for the defect in automotive painting line with range from 40% to 50% of total defect breakdown. Eventually, those defects will effect on both visual appearance and also performance of the part. In addition, the significance of controlling dust in an assembly line is crucial in order to maintain quality of the product, part performance yield and effect on workers’ health [1]. By considering the principle and technology applied in electronic clean room technology that used the ionizer to control dust contamination, the same system can be used and applied in automotive painting line. The first auto maker industry whom found the effectiveness of the clean room application to reduce the defect and production line downtime was Chrysler [2]. The clean room method and technology used to control the contamination was applied at their transmission plant and results to this, allowed it to offer 50 000 mile guarantee on its transmission. The main objective of this research is to verify the effectiveness of ionizer device to reduce the rejection contribute by dust and fibre particle in the automotive painting line. Towards the main objective, a few sub area will be explore, as a supporting factor to ensure the result gain from this study is solid and constructive. Among the factor to verify is the electrostatic value of the raw material (substrate) before and after the ionizer treatment. From here the correlation of the electrostatic value generated by the raw material that effect to production pass rate can be explore. At the meantime, the performance of the production pass rate after ionizer treatment that related to the painted surface area can be determine.
Abstract
The Malaysian automotive industry has been moving through economy growth based on the shifting business between foreign and local private and state sectors. The Malaysian government understands the needs of having an automotive parts and aftermarket trade fair to boost the industry. Moreover, based on the performance of automotive industry that Malaysian have today, further development could be suggested and implemented to reduce the non added values. For example, many automotive parts manufacturers are facing the problems of defects in the painting process. This problem is actually more costly because it is usually detected on the final goods. Additionally, some reworking must be done and it may pay to take all the rejected goods to consignment claim. To measure all extension values defect is costly. Therefore, the use of lean manufacturing is vital in order to support and develop quality improvement of automotive industry in Malaysia. The objective of this research is to introduce lean manufacturing by implementing of Root Cause Analysis (RCA) to overcome the problem of defects in painting process.
Paper ID: 040

Product Development and Cost Analysis of fabricating the prototype of Roller Clamp Intravenous (I.V) tubing Medical Device using Fused Deposition Modeling (FDM)

Wan Ahmad Yusmawiza Wan Yusoff

Abstract
The objective of this research is to develop a new prototype and to conduct cost analysis of the existing roller clamp that is one of parts attached to Intravenous (I.V) Tubing used in Intravenous therapy medical device. Before proceed with the process to manufacture the final product using Fused Deposition Modeling (FDM) Technology, the data collected from survey were analyzed using Product Design Specifications approach. Selected concept has been proven to have better quality, functions and criteria compared to the existing roller clamp and the cost analysis of fabricating the roller clamp prototype was calculated.
Determining System Boundaries Of Commercial Broiler Operation In Malaysia Using Life Cycle Assessment (LCA) Approach: Case Study

Atiah Abdullah Sidek, Syakira Afiqah Suffian, Che Saiful Asmawi Che Ismail, Hazlina Md Yusof

Abstract
Abstract. The demand of poultry product in Malaysia market shows an escalation throughout the year and expected to increase in the future. The expansion of poultry production has led to environmental concern in relation to their operational impact to environment. At present, assessment of waste management of poultry production in Malaysia is lacking. A case study research was conducted in a commercial broiler farm to identify and assess the system boundaries in the lifecycle supply chain of broiler chicken production using ISO 14040/44 guidelines. ISO 14040/44 standard includes Life Cycle Assessment (LCA) framework guidelines to evaluate environmental influence associated with a product/process throughout its life span. All attributes associated with broiler operation is defined and the system boundaries is determined to identify possible inputs and outputs in the case study. This paper discuss the initial stage in the LCA process, which set the context of the research and prepare for the stage of Life Cycle Inventory.
Paper ID: 042
Inventory Data On Commercial Broiler Chicken Production System Using Life Cycle Assessment Approach: A Case Study

Syakira Afiqah Suffian, Atiah Abdullah Sidek, Che Saiful Asmawi Che Ismail, Hazlina Md Yusof

Abstract

Abstract. An increasing demand for food shows escalation every year especially in chicken meat consumption. An inventory data of the life cycle of broiler chicken production from cradle-to-gate perspective was carried out with the aim to identify measurement of input and output parameters involved in the system. To do so, broiler chicken production in Myra Chicken Farm and Services was investigated in detail. Result shows the inventory data on feed consumption, transportation, physical performance parameter and other utilities that affect the product which is broilers. Broilers production in fact shows escalation year by year because of high demand from consumer. A cradle-to-gate assessment was conducted based on ISO 14040/14044 guidelines. Inventory data was gathered from farmers and available literature. Improving all the input and output system will increase the level of productivity and the cost of the production. Thus, at the end of the research, it will able to make industry player to understand and take into consideration the solutions in order to promote a green broiler chicken production.
Paper ID: 043
Evaluating 8 Pillars of Total Productive Maintenance (TPM) Implementation and Their Contribution to Manufacturing Performance

Erry Yulian T Adesta, Herry Agung Prabowo

Abstract
TPM is one method to improve manufacturing performance through an emphasis on maintenance that involves everyone in the organization. Research on the application of TPM and its relation to the manufacturing performance has done quite a lot. However, a study that discusses how the application of 8 pillars TPM (especially in developing countries) is still hard to find. This paper tries to evaluate in more detail about how the 8 pillars of TPM are applied in Indonesia and their impact on manufacturing performance. This paper is a pilot study with a target of 50 companies. From the results of data collection only 22 companies (44%) are eligible for being processed. Data processing using SPSS and Smart PLS tools. From result of validity and reliability test seen all items / indicators for TPM pillars is Valid and Reliable with correlation value (R) 0.614 - 0.914 and with Cronbach's alpha equal to 0.753. As for the Manufacturing Performance construct there is 1 indicator that is not valid which is Delivery. But overall is reliable with Cronbach's alpha of 0.710. From the results of Confirmatory Factors Analysis (CFA) for TPM, seen that 4 indicators (pillars) have been very significant while 4 other indicators are less significant. For MP there are 3 indicators that are significant and 2 are not significant. In general, the structural model of the relationship between TPM and MP is quite STRONG and Positive with values $R = 0.791$ and $R^2 = 0.626$. 
Paper ID: 045
Surface Modification of Polycaprolactone (PCL) Microcarrier for Performance Improvement of Human Skin Fibroblast Cell Culture

Nurhusna Samsudin, Yumi Zuhanis Has-Yun Hashim, Mohd Azmir Arifin, Maizirwan Mel, Hamzah Mohd Salleh, Iis Sopyan

Abstract
Polycaprolactone (PCL) has many advantages for use in biomedical engineering field. In the present work PCL microcarriers of 150-200 µm were fabricated using oil-in-water (o/w) emulsification coupled with solvent evaporation method. The surface charge of PCL microcarrier was then been improved by using ultraviolet/ozone treatment to introduce oxygen functional group. Immobilisation of gelatin onto PCL microspheres using zero-length crosslinker provides a stable protein-support complex, with no diffusional barrier which is ideal for mass processing. The optimum concentration of carboxyl group (COOH) absorbed on the surface was 1495.9 nmol/g and the amount of gelatin immobilized was 1797.3 µg/g on UV/O3 treated microcarriers as compared to the untreated (320 µg/g) microcarriers. The absorption of functional oxygen groups on the surface and the immobilized gelatin was confirmed with the attenuated total reflectance Fourier transformed infrared spectroscopy (ATR-FTIR) and the enhancement of hydrophilicity of the surface was confirmed using water contact angle measurement which decreased (86.93° – 49.34°) after UV/O3 treatment and subsequently after immobilisation of gelatin. The attachment and growth kinetics for human skin fibroblast cell (HSFC) showed that adhesion occurred much more rapidly for gelatin immobilised surface as compared to untreated PCL and UV/O3 PCL microcarrier.
Paper ID: 046

Compressive Behaviour and Energy Absorption of Aluminium Foam Sandwich

Muataz Hazza F. Al Hazza, Amalina Endut, Atiah Bt. Abdullah Sidek Bt. Abdullah Sidek, Erry Y. T. Adesta

Abstract

Development of materials in automotive industries plays an important role in order to retain the safety, performance and cost. Metal foams are one of the idea to evolve new material in automotive industries since it can absorb energy when it deformed and good for crash management. Recently, new technology had been introduced to replace metallic foam by using aluminium foam sandwich (AFS) due to lightweight and high energy absorption properties. Therefore, this paper provides reliable data that can be used to analyze the energy absorption behaviour of aluminium foam sandwich by conducting experimental work which is compression test. 6 experiments of the compression test were carried out to analyze the stress-strain relationship in terms of energy absorption behavior. The effects of input variables include varying the thickness of aluminium foam core and aluminium on energy absorption behavior were evaluated comprehensively. Based on experimental work, it was found that when increasing the aluminium foam and aluminium sheets thickness, it can absorb large energy which will converts into strain energy which give the value of 56.505 J.
Paper ID: 048

Antiwashout Behavior of Calcium Phosphate Cement Incorporated with Poly(ethylene glycol)

Sufiamie Hablee, Iis Sopyan, Maizirwan Mel, Hamzah Mohd. Salleh, Md. Mujibur Rahman

Abstract

The effect of powder-to-liquid ratio and addition of poly(ethylene glycol) on the antiwashout behavior of calcium phosphate cement have been investigated. Calcium hydroxide, Ca(OH)2, and diammonium hydrogen phosphate, (NH4)2HPO4, were used as precursors with distilled water as the solvent in the wet chemical precipitation synthesis of hydroxyapatite powder. Cement paste was prepared by mixing the as-synthesized powder with distilled water at certain ratios, varied at 1.0, 1.3, 1.5 and 1.6. Poly(ethylene glycol) was added into distilled water, varied at 1, 2, 3, 4 and 5 wt% using the powder-to-liquid ratio of 1.3. The antiwashout properties of the cement has been investigated by soaking in Ringer’s solution for 3 and 7 days. The evolution of compressive strength of calcium phosphate cement before and after soaking have been determined. Before soaking, the compressive strength of the cement ranged from 0.416 MPa to 1.344 MPa. After 7 days soaking, the strength increased to the range of 0.879 MPa to 1.384 MPa. Addition of poly(ethylene glycol) up to 3% show the increased in strength, from the range of 1.167 MPa to 1.786 MPa before soaking to the range of 1.384 MPa to 2.079 MPa after 7 days soaking. The calcium phosphate cement produced in this current study shows excellent antiwashout behavior since no cement dissolution happened and the compressive strength of the cement increased with soaking time throughout 7 days soaking in Ringer’s solution.
Abstract
Alumina or Aluminium Oxide (Al2O3) is well known for its high strength and hardness. Its low heat retention and low specific heat characteristics make it attractive to be used widely as a cutting tool for grinding, milling and turning processes. Various synthesis methods have been used for the purpose of enhancing the properties of the alumina inserts. However, the optimization process using Hot Isostatic Pressing (HIP) has not been performed. This research aims in finding the optimum parameters in synthesizing the alumina inserts (98Al2O3 1.6ZrO2 0.4MgO, 93Al2O3 6.4ZrO2 0.6MgO and 85Al2O3 14.5ZrO2 0.5MgO) using HIP at different temperatures (1200, 1250 and 1300°C) and sintering time (10, 30 and 60 minutes). Hardness, density, shrinkage and microstructure using SEM were analysed. The optimum sintering condition for the alumina insert was found in 98Al2O3 1.6ZrO2 0.4MgO sintered at 1300°C for 60 minutes for it exhibited the highest values of hardness (1917HV), density (3.95g/cm3), shrinkage (9.6%).
Paper ID: 050

In-situ polymerization of Polyaniline/Polypyrrole Copolymer using different techniques for different nanostructures production

Ahmed hammad, Hussain Noby, Marwa Elkady, Ahmed Elshazly

Abstract

The morphology and surface area of the Poly(aniline-co-pyrrole) copolymer (PANPY) are important properties which improve the efficiency of the copolymer in various applications. In this investigation, different techniques were tested to produce PANPY in different morphologies. Aniline and pyrrole were used as monomers, and ammonium peroxydisulfate (APS) was used as an oxidizer with uniform molar ratio. Rapid mixing, drop-wise mixing, and supercritical carbon dioxide (ScCO2) polymerization techniques were appointed. The chemical structure, crystallinity, porosity, and morphology of the composite were distinguished by Fourier transform infrared spectroscopy (FT-IR), X-ray diffraction (XRD), Brunauer, Emmett and Teller (BET) analysis, and transmission electron microscopy (TEM) respectively. The characterization tests indicated that the polyaniline/polypyrrole copolymer was successfully prepared with different morphologies. Based on the obtained TEM, hollow nanospheres were formed using rapid mixing technique with acetic acid that have a diameter of 75 nm and thickness 26 nm approximately. Also, according to the XRD, the produced structures have a semi-crystalline structure. The synthesized copolymer with ScCO2-assisted polymerization technique showed improved surface area (38.1 m²/g) with HCl as dopant.
Paper ID: 051
Effects of Sintering Schedule to the Characteristics of FeCrAl Powder Compacts Formed at Elevated Temperature

Md. Mujibur Rahman, Hendri Yani Rahman, Muhammad Amir Afzam Awang, Iis Sopyan

Abstract
This paper presents the outcomes of an experimental investigation on the effect of sintering schedule, i.e., holding time and temperature to the final properties of FeCrAl powder compacts prepared through uniaxial die compaction process at above room temperature. The feedstock was prepared by mechanically mixing iron powder ASC 100.29 with chromium (22 wt%) and aluminium (11 wt%) for 30 min at room temperature. A cylindrical shape die was filled with the powder mass and heated for one hour for uniform heating of the die assembly together with the powder mass. Once the temperature reached to the setup temperature, i.e., 150ºC, the powder mass was formed by applying an axial pressure of 425 MPa simultaneously from upward and downward directions. The as-pressed green compacts were then cooled to room temperature and subsequently sintered in argon gas fired furnace at a rate of 5ºC/min for three different holding times, i.e., 30, 60, and 90 min at three different sintering temperatures, i.e., 800, 900, and 1000ºC. The sintered samples were characterized for their density, electrical resistivity, bending strength, and microstructure. The results revealed that the sample sintered at 1000ºC for 90 min achieved the better characteristics.
Comparison Study On Biosynthesis Of Silver Nanoparticles Using Fresh And Hot Air Oven Dried Imperata Cylindrica Leaf

Noor Najmi Bonnia, Afiza Ahmad Fairuzi, Rabiatul Adawiyah Md Akhir, Sabrina M Yahaya, Noor Azlina Hassan

Abstract
The perennial rhizomatous grass; Imperata cylindrica (I. cylindrica) has been reported rich in various phytochemicals. In present study, silver nanoparticles were synthesized from aqueous leaf extract of I. cylindrica at two different leaf conditions; fresh leaves and hot-air oven dried leaves. Biosynthesized silver nanoparticles were characterized by UV-visible spectroscopy, field emission scanning electron microscopy (FESEM) and Fourier transform infrared spectroscopy (FTIR). Maximum absorption was recorded between 400 nm to 500 nm. FESEM analysis revealed that the silver nanoparticles predominantly form spherical shapes. The particles sizes were ranging from 22-37 nm. The elemental composition of the synthesized silver nanoparticles was confirmed by using energy dispersive X-ray spectroscopy (EDX) analysis. Fourier transform infrared spectroscopy (FTIR) confirmed the reducing and stabilizing actions came from biomolecules associated with I. cylindrica leaf extract. Thus in this investigation, an environmentally safe method to synthesized silver nanoparticles using local plant extract was successfully established.
Paper ID: 053
Vibration Isolation Analysis of New Design OEM Damper for Malaysia Vehicle Suspension System featuring MR Fluid

Mohd Hishamuddin Unuh, Pauziah Muhamad, Norfazrina Hayati Mohd Yatim, Mohamad Amiruddin Ismail, Zaimi Tanasta

Abstract
The applications of semi-active damper employing magnetorheological (MR) fluids keep increasing in fulfilling the demand to control undesired vibration effect. The aim of this study is to introduce the new design of damper for Malaysian vehicle model. The vibration isolation performance of the OEM damper featuring MR fluid was analysed physically under real road profile excitation experimentally. An experiment using quarter car rig suspension and LMS SCADAS Mobile was conducted to demonstrate the influence of current in controlling the characteristics of MR fluid in alter the damping behaviour under 5 cm bump impact. Subsequently, the displacement values were measured with respect to time. The OEM damper featuring MR fluid was validated by comparing the data with original equipment manufacturer (OEM) passive damper results under the same approach of testing. Finally, the OEM damper featuring MR fluid has effectively isolated the disturbance from the road profile and control the output force.
An Examination Of How A Small And Medium Enterprise Stakeholder Influence Green Supply Chain Management Practices

M. Zulhilmi Shahlan, Atiah Abdullah Sidek, Syakira Afiqah Suffian, Muataz Hazza Faizi al Hazza, Mohd Radzi Che Daud

Abstract
In this paper, climate change and global warming are the biggest current issues in the industrial sectors. The green supply chain management (GSCM) is one of the crucial inputs to this issue. Effective GSCM can potentially secure the organization’s competitive advantage and improve the environmental performance of the network activities. In this study, the aim is to investigate and examine how a small and medium enterprises (SMEs) stakeholder pressure and top management influence green supply chain management practices. The study is further advance green supply chain management research in Malaysia focusing on SMEs manufacturing sector using structural equation modeling. Structural equation modeling is a multivariate statistical analysis technique used to examine structural relationship. It is the combination of factor analysis and multi regression analysis and used to analyze structural relationship between measure variable and latent factor. This research find that top management support and stakeholder pressure is the major influence for SMEs to adopt green supply chain management. The research also find that top management is fully mediate with the relationship between stakeholder pressure and monitoring supplier environmental performance.
Exploring How Environmental Management Competitive Pressure Affect An SME Environmental Innovation Activities: A Green Supply Chain Perspective

Akmal Abdul Rashid, Atiah Abdullah Sidek, Syakira Afiqah Suffian, Mohd Radzi Che Daud, Muataz Hazza Faizi al Hazza

Abstract
The idea of assimilating green supply chain is to integrate and collaborate environmental management into the supply chain practices. The study aims to explore how environmental management competitive pressure influences a SME company in Malaysia to incorporate green supply chain integration, which is an efficient platform to develop environmental innovation. This study further advances green supply chain management research in Malaysia by empirically testing the model developed based on a sample of SMEs in Malaysia in manufacturing sector using structural equation modelling. The model developed in this study illustrates how environmental management competitive pressure from main competitors affects three fundamental dimensions of green supply chain integration. The research findings suggest that environmental management competitive pressure is a vital driving force for a SME company to incorporate internal and external collaboration in developing green product innovation. From the analysis conducted, the study strongly demonstrated that the best way for a company to counteract competitor's environmental management success is to first implement strong internal green product development process then move on to incorporate external environmental management innovation between their suppliers and customers. The findings also show that internal integration of green product innovation fully mediates the relationship of environmental management competitive pressure and the external integration of green product innovation.
Paper ID: 058
Modeling and Simulation of Graphene/Palladium catalyst reformer for hydrogen generation from waste of IC engine

Ataur Rahman, Kaw Myo Aung, Rafia Afroz

Abstract
The small amount of hydrogen produced by the onboard reformer is added to the normal intake air and the gasoline mixture in the vehicle's engine could improve the overall combustion quality and reduce emissions. Several studies have been carried out on the reformer to generate hydrogen to form the hydrocarbon to improve engine performance and improve emissions. This study presents the catalyst vapor reformer Palladium (Pd) / Graphene oxide (GO) to generate hydrogen by formatting the exhaust of the IC engine with the focus of waste into wealth and improve the emission. The COMSOL multi-physics software has been used to investigate the reformer's performance theoretically. Different percentages by weight (wt%) of palladium (Pd) and graphene oxide (GO) were considered for the reformer model and the simulation was carried out. The result shows that the catalyst composition (30% by weight of Pd and 70% by weight of GO) produces 23% hydrogen for the exhaust temperature of 600-900 ° C and 20% for 800-900 ° C. Hydrogen pumping increases atomization and vaporization of the fuel under engine idling conditions, which could improve fuel combustion efficiency and braking power. This study shows that engine brake power can be increased by about 10% by pumping 7% hydrogen from the total fuel into the engine. The performance comparison has been made between the gasoline engine with the reformer for the catalyst composition of (30% by weight Pd / 70% by weight of GO) and (50% by weight Pd / 50% by weight of GO) and CNG driven engine. It is found in analytical that the gasoline engine with the reformer is better than the CNG engine power by 7-10% of braking power, 10-12% of mileage and 30-35% of emission.
Analysis and modeling of delamination factor in drilling of woven kenaf fiber reinforced epoxy using Box Behnken experimental design

Suhaily Mokhtar, Che Hassan Che Haron, Jaharah A Ghani, Afifah Mohd Ali, Nor Khairussshima Mohd Khairussaleh

Abstract
In this research study, it presents a comprehensive mathematical model for correlating the influences of drilling parameters on the delamination factor during the drilling of woven kenaf fiber reinforced epoxy composite laminates using the Box Behnken experimental design. The purpose of this study is to investigate the influence of drilling parameters such as cutting speed, feed rate and drill sizes on the delamination produced when drilling woven kenaf reinforced epoxy composite using the non-coated HSS drill bits. The damage generated on the woven kenaf reinforced epoxy composite laminates were observed both at the entrance and exit surface during the drilling operation. The experiments were conducted according to the Box Behnken experimental designs.
Paper ID: 060

Study on the Mechanical Analysis of Gracilaria Lichenoides Filled Propane -1, 2, 3- Triol

Maizatulnisa Othman

Abstract
The mechanical analysis effect of gracilaria lichenoides with plasticizer were evaluated at different percentage of glycerin ranging from 1.5% to 5.5%. The tensile results of bioplastic thin film were coherent with the elongation break. In addition, scanning electron microscope (SEM) results revealed the formation of pores and crystal agglomeration was observed with an increase in percentage of plasticizer. As the improvement of bioplastic thin film produced, by products from squid had been used as a filler to utilize the biomaterials waste. Based on the analysis, varying percentage of plasticizer has tremendous impact on the production of algae matrix bioplastic thin film with required properties.
The effects of excess calcium on the handling and mechanical properties of hydrothermal derived calcium phosphate bone cement

Nurul Nabilah Razali, Muhammad Amirul Sukardi, Iis Sopyan, Maizirwan Mel, Hamzah Mohd Salleh, Md Mujibur Rahman

Abstract
The objective of this study is to determine the effects of excess calcium on the handling and mechanical properties of hydrothermal derived calcium phosphate cement (CPC) for bone filling applications. Hydroxyapatite powder was synthesized via hydrothermal method using calcium oxide, CaO and ammonium dihydrogen phosphate, NH4H2PO4 as the calcium and phosphorus precursors respectively. The effects of calcium excess were evaluated by varying the CaO content at 0, 5 and 15 mole %. The precursors were then refluxed in distilled water at 90-100˚C and dried overnight until the calcium phosphate powder was formed. CPC was then produced by mixing the synthesized powder with distilled water at the powder-to-liquid (P/L) ratio of 1.5. The result from the morphological properties of CPC shows the increase in agglomeration and particles size with 5 mole % of calcium excess but decreased with 15 mole % of calcium excess in CPC. This result was in agreement with compressive strength result where the CPC increase the strength with 5 mole % of calcium excess but reduced with 15 mole % of calcium excess. The excess in calcium precursor also significantly improved the setting time but reduced the injectability of CPC.
Paper ID: 062
Electrodeposition of Zinc Antimony Alloy Thermoelectric Materials

Assyidatul Laila Nor Hairin, Mohd Nazirul Romainor, Raihan Othman, Farah Diana Mohd Daud

Abstract
Zinc antimonite, Zn4Sb3 is a promising thermoelectric material because of its high thermoelectric performance and abundance of Zn and Sb in nature. Thus, in this study, samples of Zn-Sb alloy were prepared using electrodeposition method because of its simple experimental set-up, which also carried out in the room temperature. From the XRD results, all samples deposited exhibit Zn-Sb alloy compositions. The best results were S1 and S3 as they had dominant peaks that showed the crystal lattice of Zn4Sb3. From the SEM images, the surface morphology of Zn-Sb alloy deposited samples showed were all-irregular, course and rough structures. While, the atoms arrangement of the deposited samples were all flowery-like. Based on physical properties characterization, the best samples; S1 (0.1M ZnCl2-0.1M SbCl3, 100mA, 120min) and S3 (0.1M ZnCl2-0.1M SbCl3, 50mA, 120min), were selected and investigated their thermoelectric performances: electrical conductivity and Seebeck coefficient, to determine their power factor, PF. Heat capacity of the samples was also examined to relate it with thermal conductivity of Zn-Sb deposited samples. For thermoelectric performance, S1 obtained power factor of 1.37x10^-7 V/K. Ω.cm at 102°C with the Seebeck coefficient of 181μV/K. While as for S3, the power factor was 1.58x10^-7 V/K. Ω.cm with Seebeck coefficient of 113μV/K at 101°C. From DSC analysis, it showed that S3 obtained higher Cp than S1. Cp for S3 was 46.8093mJ/^°C while S1 was 38.3722mJ/^°C.
Abstract
The objective of the present article was to study the influence of welding parameters (current, arc voltage, travel speed and heat input) on microhardness, depth, and microstructure of the heat-affected zone (HAZ) and to optimize the process parameters after accomplishment of the TIG welding process on X65 steel following Taguchi experimental design. Microstructures of the welded samples were studied to analyze the changes in the microstructure of the material in terms of ferrite, pearlite, bainite, and martensite formations. Welding speed was found to be the most significant factors leading to changes in microhardness and metallurgical properties. The microhardness tended to increase significantly with the increase of welding speed from 1.0 to 2.5 mm/s whereas the width of HAZ decreased. The current and arc voltage were found to be less significant in relative comparison. The increase of welding heat input caused an increase in width (depth) of HAZ and the growth of prior austenite grains and then enlarged the grain size of coarse grain heat affected zone (CGHAZ). However, the amount of martensite in HAZ decreased accompanied by an opposite change of bainite. It can be concluded that the hardness properties and the microstructural feature of HAZ area was strongly affected by the welding parameters.
The Influence of Machining Conditions and Cutting Tool Wear on Surface Roughness of AISI 4340 Steel

Natasha A. Raof, Jaharah A. Ghani, Che Hassan Che Haron, Syarif Junaidi

Abstract
Sustainable machining by using cryogenic coolant as the cutting fluid has been proven to enhance some machining outputs. The main objective of the current work was to investigate the influence of machining conditions; dry and cryogenic, as well as the cutting tool wear on the machined surface roughness of AISI 4340 steel. The experimental tests were performed using chemical vapor deposition (CVD) coated carbide inserts. The value of machined surface roughness were measured at 3 cutting intervals: beginning, middle, and end of the cutting based on the readings of the tool flank wear. The results revealed that cryogenic turning had the greatest influence on surface roughness when machined at lower cutting speed and higher feed rate. Meanwhile, the cutting tool wear was also found to influence the surface roughness, either improving it or deteriorating it, based on the severity and the mechanism of the flank wear.
Effect Of Pineapple Leaf Fibers (PALF) Concentration on Nanofibers Formation by Electrospinning

Siti Norasmah Surip, Fatimah Muyassarah Abdul Aziz, Noor Najmi Bonnia, Khairunnadim Ahmad Sekak

Abstract
Electrospinning method has been studied widely in producing nanofibers due to its straightforward and versatile method. In this study, Pineapple Leaf Fibers (PALF) solution were electrospinning to obtain mat of PALF electrospun. PALF were diluted in Trifluoacetic Acid (TFA) into five different concentrations to study the effect of concentration to the nanofibers formation. Raw sample of PALF (PALF raw), PALF after dewax (PALF dewax) and PALF after dilute with TFA (PALF TFA) were analyzed and compared using FTIR to study the structural change occur. TFA solvent has removed and recreated some of the functional group in PALF thus disrupt strong hydrogen bonds that hold hemicellulose, cellulose and lignin together. All the PALF sample has been proceed to electrospinning process. Low concentration of solution cause the solution jet to break up even before reach the collector however high concentration of solution made the solvent volatile faster and the solution dried easily. Therefore, PALF with optimum concentration of 0.02 gml-1 had favors the formation of nanofibers and succeed in forming membrane at the collector.
Abstract
The viability of MCM-41 membrane as a separator material in secondary alkaline cell is investigated. The inorganic membrane is employed in an alkaline nickel-zinc system. MCM-41 mesoporous material consists of arrays of hexagonal nano-channels. The membrane is synthesized by dip-coating procedures from parent solution comprising of quarternary ammonium surfactant, cetyltrimethylammonium bromide C16H33(CH3)3NBr (CTAB), hydrochloric acid (HCl), deionized water (H2O), ethanol (C2H5OH), and tetraethylorthosilicate (TEOS). Both the anodic zinc foil and cathodic nickel hydroxide electrodeposited film are coated with MCM-41 membrane. The Ni/MCM-41/Zn alkaline cell is then subjected to 100-cycle durability test. The charge-discharge plot showed typical secondary zinc anode profile – rapid capacity fading. X-ray diffraction analysis on the dismantled cell indicated the transformation of MCM-41 hexagonal matrix structure into MCM-50 lamellar gel form which prevent the mesoporous cell separator from diminished in the caustic alkaline surround. This work has hence demonstrated MCM-41 membrane is viable to be employed in secondary alkaline cells.
Abstract
This paper evaluates the layout and advancement of energy harvesting based on aerodynamic instabilities of an aircraft. Vibration and thermoelectric energy harvesters are substantiated as most suitable alternative low-power sources for aerospace applications. Furthermore, the facility associated with the aircraft applications in harvesting the mechanical vibrations and converting it to electric energy has fascinated the researchers. These devices are designed as an alternative to a battery-based solution especially for small aircrafts, wireless structural health monitoring for aircraft systems, and harvester plates employed in UAVs to enhance the endurance and operational flight missions. We will emphasize on various sources of energy harvesting that are designed to come from aerodynamic flow-induced vibrations, specific attention is then given at those technologies that may offer, today or in the near future, a potential benefit to reduce both the cost and emissions of the aviation industry. The advancements achieved in the energy harvesting based on aerodynamic instabilities show very good scope for many piezoelectric harvesters in the field of aerospace, specifically green aviation technology in the future.
Effect of EFB content on reducibility of low grade iron ore composite at 900°C – 1200°C

Hadi Purwanto, Hamzah Mohd Salleh, Ainun Shaheera Mohamad, Amrina Zakiyuddin, Alyaa Naili Rozhan

Abstract
Biomass have become one of the current alternatives in replacing previous reducing agent in iron making industry. Reduction of local iron ore has been widely investigated by using different types of biomass as reductant. However, recently numerous research has been done to investigate the effectiveness of biomass, especially from oil palm industry in reducing low grade iron ore into metallic iron. This paper focus on reduction of low grade iron at high temperature using palm oil empty fruit bunch as a reductant. The samples were crushed and compacted into composite pellet with EFB before drying at 110°C for 24 hours. The reduction test was then conducted by heating the composite pellet in an electric tube furnace. The parameter used was at temperature range 1000°C to 1200°C and under argon gas atmosphere. The efficiency of the empty fruit bunch in the reduction process was investigated based on the extent of reduction of the iron oxide. The results showed that the extent of reduction obtained was 38.97% at 1200°C. This study demostrate that within the temperature range studied, reducibility of low grade iron ore with empty fruit bunch tends to increase as the temperature increase.
Paper ID: 069
Effect of Temperature on Porosity of Iron Ore Sinter with Biochar Derived from EFB

Amrina Mohd Zakiyuddin, Hadi Purwanto, Alya Naili Rozhan, Ainun Shaheera Mohamad

Abstract
In this research, the replacement of fossil fuel energy (coke) with oil palm empty fruit bunch as a potential energy in sintering of iron ore was investigated. Carbon derived biomass has been produced by using oil palm empty fruit bunch by heat treatment process. In the present investigation, sintering process was carried out by heating the mixed iron ore and biochar at various temperatures. The apparent density and porosity for iron sinter show a significant increase and gradual decrement as the temperature increase, respectively. Inferring to the micrograph, the agglomeration and assimilation of sinter at high temperature is better compared with low sintering temperature.
Paper ID: 070
Particulate preplaced TIG melted surface layer of duplex stainless steel

M A Maleque, Mohd Afiq

Abstract
Despite of several good properties of duplex stainless steels (DSS), these alloy show decrease in performance under aggressive environment which may lead to unanticipated failure. Therefore, the main aim of this paper is to perform surface modification and study the effect of processing parameters in order to improve microstructure and hardness properties of DSS. Surface modification is done by using TIG torch method where silicon carbide (SiC) particles are fused into DSS substrate in order to form a new intermetallic compound at the surface. The effect of particle size, feed rate of SiC preplacement, energy input and shielding gas flow rate on surface topography, microstructure, microstructure and hardness are investigated. Deepest melt pool (1.237 mm) is produced via TIG torch with highest energy input of 1080 J/mm. Observations of surface topography shows rippling marks which confirms that re-solidification process has taken place. Melt microstructure consist of dendritic and globular carbides precipitate as well as partially melted silicon carbides (SiC) particles. Micro hardness recorded at value ranging from 316 HV0.5 to 1277 HV0.5 which shows increment from base hardness of 260 HV0.5kgf. The analyzed result showed that incorporation of silicon carbide particles via TIG Torch method increase the hardness of DSS.
Productivity Improvement Using Discrete Events Simulation approach

Muataz Hazza F. Al Hazza, Elhasan M.Y. Elbishari M.Y. Elbishari, Erry Y. T. Adesta, Nur Salihah Binti Abdul Rahman

Abstract
The increasing in complexity of the manufacturing systems has increased the cost of investment in many industries. However, the theoretical feasibility studies are not enough to take the decision in investing for that particular area. However, the development of the new advanced software is protecting the manufacturer from investing money in production lines that may not be sufficient and effective with their requirement in terms of machine utilization and productivity issue. By conducting a simulation, using accurate model will reduce and eliminate the risk associated with their new investment. The aim of this research is to prove and highlight the importance of simulation in decision-making process. Delmia quest software was used as a simulation program to run a simulation for the production line. A simulation was first done for the existing production line and show that the estimated production rate is 261 units/day. The results have been analysed based on utilization percentage and idle time. Two different scenarios have been proposed based on different objectives. The first scenario is by focusing on low utilization machines and their idle time, this was resulted in minimizing the number of machines used by three with the addition of the works who maintain them without having an effect on the production rate. The second scenario is to increase the production rate by upgrading the curing machine which lead to the increase in the daily productivity by 7% from 261 units to 281 units.
Paper ID: 072

Optimization of TiO$_2$ Thin Film Thickness for Dye Sensitized Solar Cell Applications.

Souad A.M. Al-Bat’hi, Nafees Ahmed, Raihan Othman, Maizatulnisa Binti Othman

Abstract

Dye sensitized solar cells (DSSCs) rely on the absorption of photons by the dye molecules which are transported to the conduction band of the TiO$_2$ electrode. The microstructure, energy gap and the absorption spectra of the TiO$_2$ electrodes highly affects the efficiency of the cell. In this paper, the absorption spectra and energy gap has been studied by varying the thickness of the TiO$_2$ paste. Nanocrystalline TiO$_2$ thin films were deposited on ITO glass substrate with three different thickness (4.54µm, 7.12µm and 12.3µm by using doctor blade method. After deposition all the samples were sintered at 4500°C after deposition to enhance the particle bonding and for achieving better adhesion. The samples were characterized by UV-VIS spectra for determining the absorption spectra and Scanning Electron Microscopy (SEM) for investigating the thickness and the surface morphology. Fabricating the electrodes with different thickness showed significant changes in the energy gap and from the results it can be concluded that the energy gap increases with the increased thickness. The highest energy gap of 2.25ev and absorption 3.791 was achieved by 12.3µm thick sample. The absorption spectra also shows better absorption throughout the whole visible light range but the SEM images suggests that 12.3µm thick sample shows cracks all over the deposited region which will cause current leakage when the cell is assembled. Therefore, the optimum result was achieved by 7.12µm thick sample providing 1.9ev energy gap and 3.91 absorption peak.
Effects of Water Vapor on Protectiveness of Cr$_2$O$_3$ Scale at 1073K

Syamsul Kamal Arifin, Abd. Malek Abdul Hamid, Ahmad Nukhaie Berahim, Mohd. Hanafi Ani

Abstract
Fe-Cr alloy is commonly being used as boiler tube's material. It is subjected to prolonged exposure to water vapor oxidation. The ability to withstand high temperature corrosion can normally be attributed to the formation of a dense and slow growing Cr-rich-oxide scale known as chromia, Cr$_2$O$_3$ scale. However, oxidation may limit the alloy's service lifetime due to decreasing of its protectiveness capability. This paper is to presents an experimental study of thermo gravimetric and Fourier transform infrared analysis of Cr$_2$O$_3$ at 1073K in dry and humid environment. Samples were used from commercially available Cr$_2$O$_3$ powder. It was cold-pressed into pellet shape of 12mm diameter and 3mm thick with hydraulic press for 2.4ks at 48MPa. It then sintered at 1173K in inert gas environment for 28.8ks. The samples are cooled and placed in 5mm diameter platinum pan. It is subjected to reaction in dry and wet environment at 1073K by applying 100%-Ar and Ar-5%H$_2$ gas. Each reaction period is 172.8ks utilizing Thermo Gravimetric Analyzer, TGA to quantify the mass changes. After the reaction, the samples then characterized with Fourier Transform Infrared Spectroscopy, FT-IR and Field Emission Electron Scanning Microscopy, FE-SEM. The TGA result shows mass decreasing ratio of Cr$_2$O$_3$ in wet ($P_{(H_2O)}=9.5\times10^5$Pa) and dry environment is at a factor of 1.2 while parabolic rate at 1.4. FT-IR results confirmed that water vapor significantly broaden the peaks, thus promotes the volatilization of Cr$_2$O$_3$ in wet sample. FESEM shows mostly packed and intact in dry while in wet sample, slightly porous particle arrangement compare to dry. It is concluded that water vapor species decreased Cr$_2$O$_3$ protectiveness capability.
Abstract
In obtaining the best quality of engineering components, the quality of machined parts surface plays an important role. The facts that, it improves the fatigue strength, wear resistance, and corrosion of workpiece. This paper investigates the effects of wire electrical discharge machining (WEDM) process parameters on surface roughness of stainless steel using distilled water as dielectric fluid and brass wire as tool electrode. The parameters selected are voltage open, wire speed, wire tension, voltage gap, and off time. Empirical model is developed for the estimation of surface roughness. The analysis revealed that off time has a major influence on surface roughness. The optimum machining parameters for minimum surface roughness are found to be at a 10 V open voltage, 2.84 µs off time, 12 m/min wire speed, 6.3 N wire tension, and 54.91 V voltage gap.
Paper ID: 076
Effect of Dissolved Hydrogen on Schottky Barrier Height of Fe-Cr Alloy Heterojunction

Ahmad Nukhaie Berahim, Mohd Zikri Zaharuddin, Mohd Hanafi Ani, Syamsul Kamal Arifin

Abstract
The presence of water vapour at high temperature oxidation has certain effects on ferritic alloy in comparison to dry environment. It is hypothesized that at high temperature; water vapour provides hydrogen, which will dissolve into ferritic alloy substrate and altering their electronic state at the metal-oxide interface. This work aimed to clarify the change in electronic state of metal-oxide heterojunction with the presence of hydrogen/water vapour. In this study, the Schottky Barrier (SB) was created by sputtering Cr2O3 onto prepared samples by using RF Magnetron sputtering machine. The existence of Fe/Cr2O3 junction was characterized by using XRD. The surfaces were observed by using Optical Microscope (OM) and Scanning Electron Microscope (SEM). The samples were then exposed in dry and humid condition at temperature of 473 K and 1073 K. In dry condition, 100% Ar is flown inside the furnace, while in wet condition mixture of 95% Ar and 5% H was used. I-V measurement of the junction was done to determine the Schottky Barrier Height(SBH) of the samples in the corresponding ambient. The results show that in Fe/Cr2O3 junction, with presence of hydrogen at temperature 473 K; the SBH was reduced by the scale factor of 1.054 and at 1073 K in wet ambient by factor of 1.068. Meanwhile, in Fe-Cr/Cr2O3 junction with presence of hydrogen, the value of SBH was increased by scale factor of 1.068 at temperature 473 K while at 1073 K, the SBH also increased by factor of 1.009.
Preparation of SS316L MIM feedstock with biopolymer as a Binder

Aida Ashikin Abdullah, Norita Hassan, Abu Bakar Sulong, Najlaa Nazihah Mas’ood

Abstract
This paper focuses on feedstock preparation for SS316L metal injection molding (MIM) parts. The primary step of feedstock preparation, critical powder loading, was determined by two methods: maximum filled volume calculation model and torque analysis. The critical powder loading determined by calculation was 70 vol% to 77 vol% while for experimental approaches, the value was 75 vol%. The feedstock was prepared by mixing 70 vol% of powder with 30 vol% of binder at 175°C with a speed of 50 rpm. The feedstock was analyzed by thermogravimetric analysis (TGA) and Scanning electron microscope (SEM). The composition of the feedstock after preparation was confirmed by thermogravimetric analysis (TGA). It was found that the prepared feedstock composition was maintained during the mixing step. The morphology of the feedstock before and after TGA analysis was examined by SEM.
Paper ID: 078
Undercut Feature Recognition for Core and Cavity Generation

Mursyidah Md Yusof, Mohd Salman Abu Mansor

Abstract
Core and cavity is one of the important components in injection mould where the quality of the final product is mostly dependent on it. In the industry, with years of experience and skill, mould designers commonly use commercial CAD software to design the core and cavity which is time consuming. This paper proposes an algorithm that detect possible undercut features and generate the core and cavity. Two approaches are presented; edge convexity and face connectivity approach. The edge convexity approach is used to recognize undercut features while face connectivity is used to divide the faces into top and bottom region.


Paper ID: 079

Extraction of Caustic Potash from Spent Tea for Biodiesel Production

Sarina Sulaiman, Ahmad Faiz Che Fisol, Atikah Mohamed Sharikh

Abstract

Biodiesel is an alternative to non-renewable fossil fuels due to its low gas emission and economical value. This study aims to extract caustic potash (KOH) from spent tea and to optimize the transesterification process based on parameters such as amount of catalyst, reaction temperature and methanol to oil ratio. The spent tea was first dried at 60°C prior to calcination at 600°C for two hours. Caustic Potash were extracted from the calcined spent tea. The transesterification process was done based on Design of Experiments (DOE) to study the effects of amount of catalyst ranging from 0.5 wt % to 2.5 wt %, reaction temperature from 55°C to 65°C and methanol to oil ratio from 6:1 to 12:1 at a constant agitation rate of 300 rpm for three hours. The calcined spent tea produced was recorded the highest at 54.3 wt % and the extracted catalyst was 2.4 wt %. The optimized biodiesel yield recorded was 56.95% at the optimal conditions of 2.5 wt % amount of catalyst, 65°C reaction temperature and 9:1 methanol to oil ratio.
Paper ID: 080
Effect of Different Reducing Agents on Phase Formation and Transformation Behaviour of Ni-Ti Shape Memory Alloy

Hafizah Hanim Mohd Zaki, Nik Amnani Bahrudin, Jamaluddin Abdullah, Norshahida Sarifuddin

Abstract
In this study, NiTi synthesized via solid-state sintering from Ni-TiH2 powders in reducing environments using (i) CaH2 (ii) MgH2 and (iii) CaH2 and MgH2 as in situ reducing agent were investigated. The phase formation was characterized by means of scanning electron microscope (SEM), energy-dispersive spectroscopy (EDS) and powder x-ray diffraction (XRD), while transformation behavior was analyzed using differential scanning calorimetry (DSC) measurement. Among these three reducing agents, synthesis in reducing environment using CaH2 as in situ reducing agent resulted in the formation of single phase NiTi with enthalpy change of 25-26 J/g, which is similar to melt-cast NiTi alloys. Specimens sintered in reducing environments using MgH2 and MgH2+CaH2 as in situ reducing agents have lower enthalpy change, ~16-21 J/g compared to CaH2. This work established the fact that, synthesis in different reducing environment appears to have profound effects on the phase formation and transformation behavior of NiTi.
Paper ID: 081  
Alter:ing Height Data by Using Natural Logarithm as 3D Modelling Function for Reverse Engineering Application

Nur Ilham Aminullah Abdulqawi, Mohd Salman Abu Mansor

Abstract
The raw data extracted from reverse engineering based on vision mostly do not resemble the actual geometrical representation yet. Even though the higher object surface reflected the most visible light towards the camera and yield higher number of value based on Lambertian illumination model, this does not mean the curvature profile are always accurate. After all, there are many mathematical models to shape curvature profiles into the correct representation. However, one of the most appropriate models found is the natural logarithm function. The function itself has alteration properties towards the raw data generated from reverse engineering based on vision.
Modelling and Validation of Proton Exchange Membrane Fuel Cell (PEMFC)

A K M Mohiuddin, Norasyikin Basran, Ahsan Ali Khan

Abstract
This paper is the outcome of a small scale fuel cell project. Fuel cell is an electrochemical device that converts energy from chemical reaction to electrical work. Proton Exchange Membrane Fuel Cell (PEMFC) is one of the different types of fuel cell, which is more efficient, having low operational temperature and fast start up capability results in high energy density. In this study, a mathematical model of 1.2 W PEMFC is developed and simulated using MATLAB software. This model describes the PEMFC behaviour under steady-state condition. This mathematical modeling of PEMFC determines the polarization curve, power generated, and the efficiency of the fuel cell. Simulation results were validated by comparing with experimental results obtained from the test of a single PEMFC with a 3 V motor. The performance of experimental PEMFC is little lower compared to simulated PEMFC, however both results were found in good agreement. Experiments on hydrogen flow rate also been conducted to obtain the amount of hydrogen consumed to produce electrical work on PEMFC.
Paper ID: 084
Toolpath Strategy for Cutter Life Improvement in Plunge Milling of AISI H13 Tool Steel
Erry Yulian Triblas Adesta, Avicenna Avicenna, Irfan Hilmy, Mohd Radzi Haji Che Daud

Abstract
Machinability of AISI H13 tool steel is a prominent issue since the material has the characteristics of high hardenability, excellent wear resistance, and hot toughness. A method of improving cutter life of AISI H13 tool steel plunge milling by alternating the toolpath and cutting conditions is proposed. Taguchi orthogonal array with L9 (3^4) resolution will be employed with one categoric factor of toolpath strategy (TS) and three numeric factors of cutting speed (Vc), radial depth of cut (ae), and chip load (fz). It is expected that there are significant differences for each application of toolpath strategy and each cutting condition factor toward the cutting force and tool wear mechanism of the machining process, and medial axis transform toolpath could provide a better tool life improvement by a reduction of cutting force during machining.
Mechanical Properties, Morphology, and Hydrolytic Degradation Behavior of Polylactic Acid / Natural Rubber Blends

Yose Fachmi Buys, Aisyah Nur Atiqah Aznan, Hazleen Anuar

Abstract
Due to its biodegradability and renewability, polylactic acid (PLA) has been receiving enormous attention as a potential candidate to replace petroleum based polymers. However PLA has limitation due to its inherent brittleness. In order to overcome this limitation, blending PLA with elastomeric material such as natural rubber (NR) are commonly reported. In previous, several researches on PLA/NR blend had been reported, with most of them evaluated the mechanical properties. On the other hand, study of degradation behavior is significance as control of materials degradation is required in some applications. This research studied the effect of blend composition on mechanical properties, morphology development, and hydrolytic degradation behavior of PLA/NR blends. Tensile test and impact test of PLA/NR blends with difference composition had been conducted to evaluate the mechanical properties. The addition of NR improved the elongation at break and impact strength of the blends, but reduced the tensile strength and stiffness of the specimens. Dynamic Mechanical Analysis (DMA) measurements of the blends displayed two peaks at temperature -70˚C which corresponded to Tg of NR and 65˚C which corresponded to Tg of PLA. Field Emission Scanning Electron Microscopy (FE-SEM) micrograph of 70/30 PLA/NR specimen also showed two distinct phases, which lead to indication that PLA/NR blends are immiscible. Hydrolytic degradation behavior was evaluated by measuring the weight loss of the samples immersed in sodium hydroxide solution for a predetermined times. It was shown that the degradation behavior of PLA/NR blends is affected by composition of the blends, with 100 PLA and 70/30 PLA/NR blend showed the fastest degradation rate and 100 NR displayed the slowest one.
Paper ID: 086
Investigation of tool engagement and cutting performance in machining a pocket

Roshaliza Hamidon, Erry Yulian Triblas Adesta, Muhammad Riza

Abstract
This study investigates the variation of tool engagement for different profile of cutting. In addition, behavior of cutting force and cutting temperature for different tool engagements for machining a pocket also been explored. Initially, simple tool engagement models were developed for peripheral and slot cutting for different types of corner. Based on these models, the tool engagements for contour and zig zag tool path strategies for a rectangular shape pocket with dimension 80 mm x 60 mm were analyzed. Then, experiments were conducted to investigate the effect of tool engagements on cutting force and cutting temperature for the machining of a pocket of AISI H13 material. The cutting parameters used were 150m/min cutting speed, 0.05mm/tooth feed, and 0.1mm depth of cut. Based on the results obtained, the changes of cutting force and cutting temperature performance there exist a relationship between cutting force, cutting temperature and tool engagement.
Band Diagram Model for Unusual Energy Separations of Subband in Highly Doped Si(111) p-type Inversion Layer

Nur Idayu Ayob, Sakura N. Takeda, Takeshi J. Inagaki, Hiroshi Daimon

Abstract
The measured hole subbands of Indium adsorbed Si(111) p-type inversion layer (IL) were compared with the results calculated by a Triangular Potential Approximation (TPA) and the discrepancies were found to occur within 0.2 eV to 0.3 eV. This means that the band bending of the Indium adsorbed Si(111) is a special profile that cannot be approximated by a triangular potential. Therefore, subbands in the IL with different band bending profiles were determined by numerically solving the Schrödinger equation. It was found that empirical IL profile can reproduce this experiment results. IL profile that best reproduces the experimental results, which has a flat profile at the top of the surface and gradually decrease to the bulk, is Flat Top Potential Profile (FTPP). The energy levels that quantized in this potential profile were calculated and we found that the calculated energy eigenvalues from FTPP consistent with the measured levels within 0.00 to 0.01 eV. Furthermore, based on the Secondary Ion Mass Spectrometry (SIMS) results, the origin of FTPP was believed to be desorption of As atoms within the subsurface region of Si substrate. It is concluded that the band bending profile is affected by the change of impurity concentrations via dopant out-diffusion.
Abstract
Corrosion inhibitor from extraction of plant has been considered as the most preferable and most chosen technique to prevent corrosion of metal in acidic medium because of the environmental friendly factor. In this study, black tea leaves extraction was tested as corrosion inhibitor for mild steel in 0.1M of hydrochloric acid (HCl) with the absence and presence of corrosion inhibitor. The efficiency and effectiveness of black tea as corrosion inhibitor was tested by using corrosion weight loss measurement experiment was carried out with varies parameters which with different concentration of black tea extract solution. The extraction of black tea solution was done by using aqueous solvent method. The FT-IR result shows that black tea extract containing compounds such as catechin, caffeine and tannins that act as anti-corrosive reagents and responsible to enhance the effectiveness of black tea extract as corrosion inhibitor by forming the hydrophobic thin film through absorption process. As a result of weight loss measurement, it shows that loss in weight of mild steel reduces as the concentration of inhibitor increases. The surface analysis was done on the mild steel samples by using SEM.
Paper ID: 089  
**Ginger Extract as Green Corrosion Inhibitor of Mild Steel in Hydrochloric Acid Solution**

Azreen Fidrusli, Suryanto Suryanto, Mahmood Mahmood

**Abstract**

Ginger extract as corrosion inhibitor from natural resources was studied to prevent corrosion of mild steel in acid media. Ginger rhizome was extracted to produce green corrosion inhibitor (G-1) while ginger powder bought at supermarket was also extract to form green corrosion inhibitor (G-2). Effectiveness of inhibitor in preventing corrosion process of mild steel was studied in 1.0 M of hydrochloric acid. The experiment of weight loss method and polarization technique were conducted to measure corrosion rate and inhibition efficiency of mild steel in solution containing 1.0 M of hydrochloric acid with various concentration of inhibitor at room temperature. The results showed that, the rate of corrosion dropped from 8.09 mmpy in solution containing no inhibitor to 0.72 mmpy in solution containing 150g/l inhibitor while inhibition efficiency up to 91% was obtained. The polarization curve in polarization experiments shows that the inhibition efficiency is 86% with high concentration of inhibitor. The adsorption of ginger extract on the surface of mild steel was observed by using optical microscope and the characterization analysis was done by using pH measurement method. When high concentration of green inhibitor in the acid solution is used, the pH at the surface of steel is increasing.
A comparison between destructive and non-destructive techniques in determining coating thickness

Farag Haider, Suryanto Suryanto, Muhammad Ani, Mahmood Mahmood

Measuring coating thickness is an important part in researches that involved in coating applications. In general, techniques for measuring coating thickness may be divided into destructive and non-destructive methods which are commonly used depending on the applications. The objective of this study is to compare two methods measuring the coating thickness of electroplating copper coating on the austenitic stainless-steel substrate. The electroplating was carried out in a solution containing 200 g/L CuSO4, 100 g/L H2SO4 at room temperature and current of 40mA/cm2 during 20, 40, 60, 80 and 100 sec. Cross section analysis as a destructive technique and weight gain as a non-destructive technique were used. The results show that the thickness measured by the optical microscope and by the electric balance was in the same range with minimum difference as percent, 4.11% at 20 sec and maximum difference as percent 5.27% at 100 sec. Moreover, though the weight gain method is fast and gives the indication for the termination of a coating process, information regarding the uniformity, porosity and the presence of cracks cannot be obtained. On the other hand, determining the coating thickness using destructive method will damage the sample.
Mechanical Properties of Hybrid SiC/CNT Filled Toughened Epoxy Nanocomposite

Suzana Ratim, Sahrim Ahmad, Noor Najmi Bonnia, Sabrina M. Yahaya

Abstract
Mechanical properties of epoxy the nanocomposite filled single filler has been extensively studied by various researchers. However, there was not much discovery on the behavior of hybrid nanocomposite. In this study, hybrid nanocomposites of toughened epoxy matrix filled CNT/SiC nanoparticles were investigated. The hybrid composite samples were prepared by combining CNT and SiC nanoparticles in toughened epoxy matrix via mechanical stirring method assisted with ultrasonic cavitations. The resin and liquid rubber mixture were first blend prior to the addition of nanofillers. Then, the curing process of the nanocomposite samples were conducted by compression molding technique at temperature of 130°C for 2 hours. The purpose of this study is to investigate the hybridization effect of two different nanofillers loading on mechanical properties of polymer matrix. The total loading of single and hybrid nanofillers were fixed to 4% volume out of the total composite amount, which are 0S0C, 0S4C, 4S0C, 3S1C, 2S2C, and 1S3C. The tensile, flexural and impact properties were evaluated based on toughened epoxy matrix, single and hybrid filled nanocomposites. The tensile results of single filled nanocomposites are increased with the addition of CNT or SiC. The hybrid composite tensile strength and modulus were found to be reduced by hybridization of these two nanofillers in a matrix. However, the values are still above than toughened epoxy matrix. The addition of CNT and SiC nanoparticles in matrix show vise versa result on flexural and impact properties. However, there is slightly improvement with the hybridization of both filler in the matrix. FESEM observations have proved that at the same nanofiller loading, better distribution achieved by SiC nanoparticles than CNT which contributed to higher tensile strength and modulus.
Protective Behavior of Poly(m-aminophenol) and Polypyrrole Coatings on Mild Steel

Sabrina M Yahaya, Mohamad Kamal Harun, Rosmamuhadani Ramli, Suzana Ratim, Noor Najmi Bonnia Bonnia

Abstract
Electrodeposition of polypyrrole (PPy) and poly (m-aminophenol) (PAMAP) films on mild steel (MS) substrate was achieved in 0.3M oxalic acid solution and 0.3M NaOH, water:ethanol (70:30) solvent respectively using cyclic voltammetry technique. The morphology of the films constructed was determined by scanning electron microscope (SEM) and EDX. The corrosion performance of MS for both polymer coatings in 0.5M NaCl solutions were investigated by using polarization curves and electrochemical impedance spectroscopy (EIS). It was found that the PPy coating provide anodic protection while PAMAP provide cathodic protection.
Transient Flow in a Compressor Blade Row for a Periodic Vibration Motion

Moumen Idres, Mohamed Labanie, Mohamed Okasha

Abstract
The goal of this work is to set up a transient blade row simulation using the Fourier Transformation model as part of blade flutter modeling. An integral step of blade flutter modeling is the calculation of the aerodynamic damping factor as a function of the possible nodal diameters for the component being modeled. When the number of passages in the component is an integer multiplier of the nodal diameter, the number of blade passages required to model a given nodal diameter can be substantially reduced by using the rotational periodic boundary conditions. This eliminates the need to model the full component. By using the Fourier Transformation model, the number of passages required can be kept to a minimum of two for all nodal diameters. In this work, unsteady flow in a compressor rotor blades vibrating in a harmonic motion is considered. The flow work is evaluated and used to predict aerodynamic damping of the blades.
Abstract
3D imaging technologies have undergone massive revolution in recent years. Despite this rapid development, documentation of 3D cultural assets in Malaysia is still very much reliant upon conventional techniques such as measured drawings and manual photogrammetry. There is very little progress towards exploring new methods or advanced technologies to convert 3D cultural assets into 3D visual representation and visualization models that are easily accessible for information sharing. In recent years, however, the advent of computer vision (CV) algorithms make it possible to reconstruct 3D geometry of objects by using image sequences from digital cameras, which are then processed by web services and freeware applications. This paper presents a completed stage of an exploratory study that investigates the potentials of using CV automated image-based open-source software and web services to reconstruct and replicate cultural assets. By selecting an intricate wooden boat, Petalaindera, this study attempts to evaluate the efficiency of CV systems and compare it with the application of 3D laser scanning, which is known for its accuracy, efficiency and high cost. The final aim of this study is to compare the visual accuracy of 3D models generated by CV system, and 3D models produced by 3D scanning and manual photogrammetry for an intricate subject such as the Petalaindera. The final objective is to explore cost-effective methods that could provide fundamental guidelines on the best practice approach for digital heritage in Malaysia.
Paper ID: 096

Understanding the significant production variables of fish gelatin nanoparticles production by Plackett-Burman design

Deni Subara, Irwandi Jaswir, Maan Fahmi Rashid Alkhatib, Ibrahim Ali Noorbatcha

Abstract
The aim of this experiment is to screen and to understand the process variables on the fabrication of fish gelatin nanoparticles by using quality-design approach. The most influencing process variables were screened by using Plackett-Burman design. Mean particles size, size distribution, and zeta potential were found in the range 240±9.76 nm, 0.3, and −9 mV respectively. The Analysis of Pareto chart explained that concentration of acetone, pH of solution during precipitation step and volume of cross linker had a most significant effect on particles size of fish gelatin nanoparticles. According to this study, time and chemical consuming were low compared to previous research. In conclusion, this study revealed the potential of quality-by design in understanding the effects of process variables on the fish gelatin nanoparticles production.
Paper ID: 097

Electrical Discharge Machining (EDM) using Aluminum Oxide Powder mixed Dielectric Fluid

Ahsan Ali Khan, Mohiuddin AK, Muhammad Alif Abdul Latif

Abstract

This paper discusses the effect of aluminium oxide (Al₂O₃) addition to dielectric fluid during electrical discharge machining (EDM). Aluminium oxide was added to the dielectric used in the EDM process to improve its performance when machining the stainless steel AISI 304, while copper was used as the electrode. Effect of the concentration of Al₂O₃ (0.3 mg/L) in dielectric fluid was compared with EDM without any addition of Al₂O₃. Surface quality of stainless steel and the material removal rate were investigated. Design of the experiment (DOE) was used for the experimental plan. Statistical analysis was done using ANOVA and then appropriate model was designated. The experimental results show that with dispersing of aluminium oxide in dielectric fluid surface roughness was improved while the material removal rate (MRR) was increased to some extent. These indicate the improvement of EDM performance using aluminium oxide in dielectric fluid. It was also found that with increase in pulse on time both MRR and surface roughness increase sharply.
Experimental Study of Electrical Discharge Drilling of Stainless Steel UNS S30400

Ebrahim Hanash, Mohammad Yeakub Ali

Abstract
In this study, overcut and taper angle were investigated in machining of 304 stainless steel against three different parameters which are electric current, pulse on time (Ton) and pulse off time (Toff). The electrode used was of 1 mm diameter with aspect ratio of 10. Dimensional accuracy was measure by evaluating the overcut and the taper angle. Those two measurements were performed using optical microscope. The experimentation planning, evaluation, analysis and optimization have been carried out using DOE software version 10.0.3 based on RSM method with total number of twenty experiments. The research reveals that, discharge current was found to have the most significant effect on the overcut and the taper angle as well followed by pulse on time and pulse off time. As the discharge current and pulse on time increase, the overcut and taper angle are increased. In the case of the pulse off time, as it increases, the overcut and taper angle decreases. The outcome result of this study will be very useful in the manufacturing industry to select the appropriate parameters for the selected work material. The model has shown a great accuracy with percentage error of less than 5%.
Paper ID: 099

The Optimization Study on the Tool Wear of Carbide Cutting Tool during Milling Carbon Fibre Reinforced (CFRP) using response Surface Methodology

Nor Khairusshima Muhamad khairussaleh, Muhammad Hafiz Zakwan Basir, Suhaily Mokhtar, Sharifah Imihezri Syed Saharuddin, Norhashimah Shaffiar

Abstract

Nowadays, Carbon Fibre Reinforced Plastic (CFRP) composite has become one of the famous materials in industry, such as automotive, aeronautics, aerospace and aircraft. CFRP is attractive due to its properties, which promising better strength and high specification of mechanical properties other than its high resistance to corrosion. Other than being abrasive material due to the carbon nature, CFRP is an anisotropic material, which the knowledge of machining metal and steel cannot be applied during machining CFRP. The improper technique and parameters used to machine CFRP may result in high tool wear. This paper is to study the tool wear of 8 mm diameter carbide cutting tool during milling CFRP. To predict the suitable cutting parameters within range of 3500-6220 (rev/min), 200-245 (mm/min), and 0.4-1.8 (mm) for cutting speed, speed, feed rate and depth of cut respectively, which produce optimized result (less tool wear), Response Surface Methodology (RSM) has been used. Based on the developed mathematical model, feed rate was identified as the primary significant item that influenced tool wear. The optimized cutting parameters are cutting speed, feed and depth of cut of 3500 rev/min, 200 mm/min and 0.5 mm, respectively, with tool wear of 0.0267 mm. It is also can be observed that as the cutting speed and feed rate increased the tool wear is increasing.
Effect of Different Concentration of Sodium Hydroxide (NaOH) on Kenaf Sandwich Structures

Zahurin Halim, Mursyida Aziz, Maizatulnisa Othman

Abstract
Sandwich panels are structures that made of three layers, low-density core inserted in between thin skin layers. This structure allow the achievement of excellent mechanical performance with low weight, thus this characteristic fulfill requirement to be use in aircraft application. In recent time, sandwich structures have been studied due to it has multifunctions properties and lightweight. The aim of this study is to fabricate a composite sandwich structures with biodegradable material for face sheet (skin) where the fibre being treat with different concentration of sodium hydroxide (NaOH) with 10 and 20 hours of soaking time. Kenaf fibre (treated) reinforced epoxy will be used as skins and Nomex honeycomb is chosen to perform as core for this sandwich composite structure. The mechanical properties that are evaluated such as flexural strength and impact energy of kenaf fibre-reinforced epoxy sandwich structures. For flexural test, the optimum flexural strength is 13.4 MPa and impact strength is 18.3 J.
Abstract
The purpose of this research was to evaluate the influence of dose level of electron beam on the compatibilization behavior of recycled polypropylene (rPP) in rPP/microcrystalline cellulose (MCC) composites. Initially, the rPP was irradiated (i-rPP) with various dose of electron beam (5 kGy up to 250 kGy) which then mixed with unirradiated rPP (u-rPP) at a ratio of 30:70 respectively. The composites were prepared by incorporating a series wt% of MCC fibers into rPP (u-rPP : i-rPP) using extruder and finally moulded with an injection moulding machine. The compatibility behavior of irradiated RPP were analysed with mechanical tensile and thermal methods. The results of mechanical analysis showed great improvement in tensile modulus but an increase in irradiation dosage gradually decreased this property. Nevertheless, the tensile strength exhibited a minor effect. The thermal stability of composites is lowered with increase in the absorbed dose, more significantly at higher content of MCC. Fracture surface observations reveal adhesion between the cellulose and rPP matrix.
Resistive Switching of Cu/Cu2O Junction Fabricated Using Simple Thermal Oxidation at 423 K for Memristor Application

M. H. Ani, F. Helmi, S. H. Herman, S. Noh S. A. Bakar

Abstract
Recently, extensive researches have been done on memristor to replace current memory storage technologies. Study on active layer of memristor mostly involving n-type semiconductor oxide such as TiO2 and ZnO. This paper highlight a simple water vapour oxidation method at 423 K to form Cu/Cu2O electronic junction as a new type of memristor. Cu2O is a p-type semiconductor oxide, was used as the active layer of memristor. Cu/Cu2O/Au memristor was fabricated by thermal oxidation of copper foil, followed by sputtering of gold. Structural, morphological and memristive properties were characterized using XRD, FESEM, and current-voltage, I-V measurement respectively. Its memristivity was indentified by pinch hysteresis loop and measurement of high resistance state (HRS) and low resistance state (LRS) of the sample. The Cu/Cu2O/Au memristor demonstrates comparable performances to previous studies using other methods.
Abstract
The trend of global manufacturing competitiveness has shown a significant shift from profit and customer driven business to a more harmonious sustainability paradigm. This new direction, which emphasises the interests of three pillars of sustainability, i.e., social, economic and environment dimensions, has changed the ways products are designed. As a result, the roles of design tools in the product development stage of manufacturing in adapting to the new strategy are vital and increasingly challenging. The aim of this paper is to review the literature on the attributes of design tools with regards to the sustainability perspective. Four well-established design tools are selected, namely Quality Function Deployment (QFD), Failure Mode and Element Analysis (FMEA), Design for Six Sigma (DFSS) and Design for Environment (DfE). By analysing previous studies, the main attributes of each design tool and its benefits with respect to each sustainability dimension throughout four stages of product lifecycle are discussed. This study indirectly shows the strengths and weaknesses of the design tools. Consequently, the prospective of improving and optimising the design tools is projected, and the possibility of collaboration between the different tools is discussed. Finally, the potential of developing a new design tool to fulfil the sustainability demand is also explored.
The Effect of Cutting Parameters on the Performance of ZTA-MgO Cutting Tool

Afifah Mohd. Ali, Nur Khairunnisa Mohd Zaki, Nor Ezzati Hamidon, Suhaily Mokhtar, Ahmad Zahirani Ahmad Azhar, Rubina Bahar

Abstract
The effect of cutting parameters on the performances of ZTA-MgO ceramic cutting tool investigated. The aim of this project is to discover the effect of cutting speed and feedrate on the performance of the ZTA-MgO cutting tool via wear and surface roughness measurement. CNC turning machining performed using the cutting speed, Vc range from 354 to 471 m/min and the feed rate, f are 0.1, 0.3 and 0.5 mm/rev while the depth of cut constant at 0.2 mm utilized to achieve the objectives. The flank wear, crater wear, chipping of cutting tool and surface roughness of machine stainless steel 316L surface were measured using the optical microscope and MATLAB software. The result showing that the flank wear increased with the increment of cutting speed and feed rate with the lowest value of wear with the reading of 0.061 mm achieved at Vc = 354 m/min and f = 0.1 mm/rev while the highest wear is 0.480 mm at Vc = 471 m/min and f = 0.5 mm/rev. The crater wear increased when the cutting speed and feed rate were increased until the tool met its breaking point at Vc = 471 m/min and f = 0.5 mm/rev. The lowest area of crater wear is 2.2736 mm² at Vc = 354 m/min and f = 0.1 mm/rev while the highest value is 4.8524 mm² at Vc = 471 m/min and f = 0.5 mm/rev. As for the surface roughness, the higher the cutting speed, the lower the average roughness (Ra) value. Cutting speed, Vc = 471 m/min with f = 0.1 mm/rev has the lowest value of Ra which is 0.72µm.
Abstract
Alumina (Al₂O₃) based ceramics possess good mechanical properties and suitable for the application of cutting inserts. However, this monolithic ceramics suffer from lack of toughness. Hence, there are some modification were made such as the addition of yttria stabilized zirconia (YSZ) to the Al₂O₃ helps in increasing the toughness of the Al₂O₃ ceramics. Some additives such as MgO and TiO₂ were also used to further improve the mechanical properties of ZTA. In this study, high purity raw materials which consist of ZTA-TiO₂ were mixed with different amount of MgO (0.0 – 1.0 wt %). The mixture of materials was going through wet mixing, compaction and pressureless sintering at 1600°C for one hour. The samples were characterized for phase analysis, microstructure, shrinkage rate, bulk density, Vickers hardness and fracture toughness. The ZTA-TiO₂-MgO ceramics composites sample exhibit good properties of shrinkage rate, bulk density and hardness value with sample of 0.1 wt% of MgO. The results show the second highest value of shrinkage rate and hardness value which are 13.36% and 1281 HV respectively. The bulk density measured for 0.1 wt% of MgO is 4.048 g/cm³. Based on the XRD analysis results, the secondary phase (MgAl₂O₄) was detected in the sample with 0.5 wt% of MgO onwards which leads to grains refinement, thus improve the density and hardness of ZTA-TiO₂-MgO ceramics composites.
Implementing Lean In Malaysian Universities: An Insight Of A Local Faculty Of Engineering

Mohamad Azim Mohd Khairi, Mohamed Abd Rahman

Abstract
Abundance of academic articles were published in Malaysia promoting the goodness of lean in manufacturing and industrial sector but less attention was apparently given to the possibility of obtaining the same universal benefits when applying lean in non-manufacturing sectors especially higher education. This study tries to determine the level of lean awareness among the university’s community using the Faculty) of Engineering (FoE) of a local university as the case study. It also seeks to identify typical FoE’s staff perception of the lean with regard to its benefits and the obstacles in implementing it. Web-based survey using questionnaires was carried out for 215 respondents consisting of academic and administrative staff of the faculty. Statistical Package for the Social Science (SPSS) was used to analyze the survey data collected. A total of 13.95% of respondents returned the forms. Slightly more than half of the respondents (56.7%) were aware of the existence of lean concept with mean 1.43 and standard deviation 0.504. This statement was deduced from the way respondents reacted toward lean vocabularies. However, it is important to observe that, although the number of respondents that are “aware” had exceeded the total share in terms of lean awareness, the large amount of standard deviation somewhat indicates that the real level of lean awareness of FoE as a group was very low. In terms of lean benefits, reduction of waste was favored (93.3%) by the respondents with mean 0.93 and standard deviation 0.254. For obstacles in implementing lean, lack of knowledge was selected by most respondents (86.7%) to be the major factor with mean 0.87 and standard deviation 0.346. Through the analysis done, the study may conclude that the respondents have somewhat little knowledge of lean although they have somehow heard about it.
Experimental Investigation on Frequency Shifting of Imperfect Adhesively Bonded Pipe Joint

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Abstract
Inspection test for any manufactured structure need to be performed in order to detect the existence of damage. It is to ensure the product integrity, reliability and to avoid further catastrophic failure. Modal analysis was utilized to detect structural damage as one of the Non Destructive Testing (NDT) method. Comparing the vibration signal of a healthy structure and with a non-healthy signal was performed. A modal analysis of an adhesively bonded pipe joint was investigated with a healthy joint was fabricated as a reference. The damage joint was engineered by inserting a nylon fiber, which act as an impurity at adhesive region. The impact test using hammer was utilized in this project. Identification of shifting frequency of a free supported and clamped pipe joint were performed. It was found that shifting frequency occurred to the lower side by 5%.
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Lean Energy Analysis of CNC Lathe Machine

Nur Aimi Liana bt Jamil, Nizar Amsyar Bin Md Zaki, Irfan Hilmy, MD Yusof

Abstract
The industrial sector in Malaysia is one of the main sectors that has high percentage of energy demand compared to other sector and this problem may lead to future power shortage and increasing the production cost of a company. Suitable initiatives should be implemented by the industrial companies to solve the issues such as by improving the machining system. This research presents a study of Lean Energy Analysis of Manufacturing Process which focusing on the machine tool. This research is conducted to discuss about improving the energy efficiency in a lathe machine by enhancing the cutting parameters of turning process. Energy consumption of a lathe machine is analyzed in order to identify the effect of cutting parameters towards energy consumption. It is found from this research that the combination of parameters for third run (spindle speed: 1065 rpm, depth of cut: 1.5 mm, feed rate: 0.3 mm/rev) is the most preferred and ideal to be used during the turning machining process as it consumed less energy usage.
Abstract
A secondary Ni/Zn microbattery (ca. 200 µm) has been developed in a coplanar configuration. The cell is essentially of circular design (ca. 23 mm in diameter) with a fine circular ring of ~800 µm width separating the anodic and cathodic zones, side-by-side. Unlike the stacking cell architecture, coplanar configuration offers simple design, ease of fabrication and eventually cost saving. The use of MCM-41 mesoporous silica as the membrane separator cum electrolyte reservoir enables the successful implementation of coplanar cell configuration. The fabrication of Ni/Zn microbattery first begins with electrodeposition of zinc and nickel hydroxide thin films onto patterned FR4 printed circuit board, followed by deposition of zinc oxide (ZnO) slurry onto the zinc active layer, and finally ends by multiple dip-coating procedures into MCM-41 precursor solution at an ambient temperature. Once potassium hydroxide electrolyte (6 M) is incorporated, the cell is sealed with a Perspex® sheet and acrylic resin adhesive. The microbatteries were capable to sustain more than 130 deep charge-discharge cycles. When rated at 0.1 mA, the energy density of the microbattery was around 3.82 Wh/l which is suitable for low rate applications and storage for microenergy harvesters such as the piezoelectric resonator.
Effect of Thermoplastic Polyurethane (TPU) on the Thermal and Mechanical Properties of Polylactic Acid/ Curcumin Blends

Sharifah Imihezri Syed Shaharuddin, Nor Khairussahima MK, Norhashimah M Shaffiar, Yose Fachmi Buys

Abstract
Polyactic acid (PLA) is known to be brittle by nature and thus limits the flexibility of the resin. A possible solution to enhance the flexibility of PLA is to add plasticizer such as thermoplastic polyurethane (TPU). In this study, 30-50 wt % of TPU was added into PLA/curcumin blends to improve its flexibility. The thermal analysis using differential scanning calorimetry shows that further additions of TPU at the expense of PLA only slightly affects the glass transition temperature, crystallisation temperature and melting temperature of the blends. Fibers of PLA/Curcumin/TPU were successfully drawn and Single Fiber Tensile Test (SFTT) showed vast improvement in elongation at break. The initial addition of 30 wt% of TPU to the brittle PLA/curcumin composition causes a significant increase in elongation at break by 39 times and further additions at 50 wt %, the elongation at break increases by 105 times. However, with the increase in elongation, a decrease in strength and modulus was observed.