2012 International Conference on Machine Design and Manufacturing Engineering

2012 International Conference on Metallurgy Technology and Materials

ICMDME 2012 & ICMTM 2012

CONFERENCE SCHEDULE

Jeju Island, South Korea

May 11 - 12, 2012

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Welcome to ICMDME 2012 & ICMTM 2012

ICMDME 2012 & ICMTM 2012 is an annual International Conference on Machine Design and Manufacturing Engineering, Metallurgy Technology and Materials sponsored by The trans tech publications（TTP）. ICMDME 2012 & ICMTM 2012 will be held on 11-12th May, 2012 in Jeju Island, Korea. Jeju is a world-renown resort island. It offers a unique mixture of the Korean cultural heritages and the breathtaking natural beauty with volcanic mountains and beaches in a rich subtropical atmosphere.

The aim of ICMDME 2012 & ICMTM 2012 is to provide a high-level international platform for researchers, engineers, as well as industrial professionals from all over the world to present their research results and development activities in the fields of Machine Design, Manufacturing Engineering, Metallurgy Technology and Materials. The organizing committee of conference is pleased to invite prospective authors to participate in ICMDME 2012 & ICMTM 2012.

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Venue

Conference venue: HYATT Regency Jeju

3039-1 Saekdal-dong, Seogwipo-si,Jeju-do, South Korea 697-130

Web: http://jeju.regency.hyatt.com/hyatt/hotels-jeju-regency/index.jsp?hyattprop=yes

Transportation:

Airport transfers by hotel are available and price is listed below. Please advise if you would like us to arrange this service. (Distance from Jeju Airport to hotel: 50min)

Grand Bus (45 pax) – KW 200,000 (included TAX, one way)

Coach (15 pax) – KW 150,000 (included TAX, one way)

VIP Car (4 Pax) – KW 90,000 (included TAX, one way)

Conference Schedule

May 11, 2012(Friday)	
13:00-17:00	**Registration at the Hotel Lobby**

Note: You can also register at any time during the conference.

May 12, 2012(Saturday) in Regency Ballroom C	
08:00—08:30	**Keynote Speech:Fracture Mechanics and Tribology** **Prof. Katsuyuki Kida**
08:30—09:00	**Keynote Speech: An approach to tissue analysis via topological method** **Prof. Kazuaki Nakane**
09:00—10:00	**Session 1**
10:00—10:15	**Coffee Break**
10:15—12:00	**Session 2**
12:00—13:30	**Lunch at Terrace Café or Omi Rest**
13:30—15:30	**Session 3**
15:30—15:50	**Coffee Break**
15:50—18:00	**Session 4**

Note:

(1) Certificate of Participation can be collected at the registration counter.

(2) Please copy PPT files of your presentation to the secretary when registration.

(3) The organizer doesn't provide accommodation, and we suggest you make an early reservation.

Instruction for Oral Presentation

Devices Provided by the Conference Organizer:

Laptops

Projectors & Screen

Laser Sticks

Materials Provided by the Presenters:

PowerPoint or PDF files

Duration of each Presentation:

Regular Oral Session: about 10 Minutes of Presentation 5 Minutes of Q&A

Session List

Session: 1

May 12, 2012, 09:00—10:00

Paper id:60

Title: Topological Difference of Grain Composition in the WMZ (Weld Metal Zone) in Low Carbon Steel Plates (JIS-SS400)

Author:Kazuaki Nakane, Takashi Honda, Edson Santos and Katsuyuki Kida

Abstract: Self-organization phenomena are frequent in nature. While our understanding of the pattern formation principle is progressing gradually, the index necessary to evaluate the state of the organization is not yet available.

For example, to evaluate of the phase separation pattern of a high polymer blend, two-dimensional Fourier analysis of the characteristic wavelength and Voronoi analysis of the average interdomain distance are performed. If the order patterns are uniform, the results will be satisfactory. In more complicated cases however, the above method cannot be successfully applied.

In the present work, organization of grains within the weld zone in SS400 low carbon steel is investigated. In the Hi-hardened heat affected zone (HAZ) and in the center of the weld metal zone (WMZ) of the substrate, a remarkable difference in the grain distribution was observed. A classification method based on the concept of topological quantity is proposed.

Paper id:E1056

Title: Assessment to Aesthetic Shape Using the Stability of Gripping

Author: Khusnun Widiyati, Hideki AOYAMA

Abstract: The purpose of this research is to develop a system for gripping assessment of aesthetic shape without real subjects and physical mockups. The assessment for stable gripping was performed on the basis of the amount of moment of force working in the hand. In the previous work, we developed aesthetic system which able to generate various aesthetic shapes based on the designer aesthetic intention. However, products with the aesthetic shape designs should also enable user to achieve stable grip. To solve this problem, in this paper, we propose a function of evaluating “stable gripping” for aesthetic design. The gripping assessment function estimates the possible gripping position on the aesthetic model, and then an estimation of “stable of gripping” is performed by computing the amount of moment of force working in the hand.

Paper id: E1061

Title: Transonic drag prediction on a DLR-F6 transport configuration

Author: QIUYA ZHENG, JIANHU FENG and ZUNHUAN SHEN

Abstract: The accuracy of the drag prediction is investigated by simulating the transonic flow fields around the DLR-F6 wing-body (WB) and wing-body-nacelle-pylon (WNP) configurations. A series of coarse, medium, and fine density multi-block structured patched grids for both the DLR-F6 WB and WBNP configurations are employed to examine effect of grid on forces and incremental drag by adding the nacelle and pylon. The effect of boundary layer transition specification on the drag and incremental drag are also estimated. The results show that grid

refinement decrease WB total drag by 6.8 drag counts, WBNP total drag by 15.3 drag counts. Specifying transition reduce WB total drag by 9.7 drag counts, WBNP total drag by 11 drag counts as compared to fully turbulent boundary layer computations, but transition has little effects on nacelle/pylon incremental drag.

Paper id:78

Title: Microstructure and properties of in situ fabricated Al-5wt.%Si-Al2O3 composites

Author: Cheng Ling, Zhu Degui, Gao Ying , Li Wei,Wang Bo

Abstract: Alumina reinforced aluminum matrix composites (Al-5wt.%Si-Al2O3) fabricated by powder metallurgy through hot isotactic pressing were sintered in different processes, i.e. solid and liquid phase sintering. Optical microscopy (OM), X-ray diffraction (XRD), scanning electron microscope (SEM), Energy Dispersive X-ray (EDX) techniques were used to characterize the sintered composites. The effects of solid phase and liquid phase sintering on density, microstructure, microhardness, compression and shear strength were investigated. It was found that in situ chemical reaction was completed in solid phase sintering, but the composites had lower microhardness, comprehension and shear strength due to low density and segregation of alumina and Si particles in microstructure. Segregation of reinforcement particles in solid phase sintering resulted from character of solid reaction and Si diffusion at high temperature over a long hold time.

Paper id:66

Title: Effect of thrust load and rotation speed on wear loss in PPS race – PTFE retainer hybrid polymer thrust bearings under dry contact

Author: Koshiro MIZOBE,Takashi HONDA,Hitonobu KOIKE,Edson Costa SANTOS,Katsuyuki KIDA and Yuji KASHIMA

Abstract: In order to establish an optimal material combination for the production of polymer thrust bearings, two types of components: retainer and PPS races - PPS retainer were tested by rolling contact fatigue (RCF). The wear properties of both bearing types were investigated and a relationship between thrust load, rotation speed and wear loss was established. It is concluded that by using a PTFE retainer, it is possible to improve the wear loss and under specific conditions, no wear at all could be observed on the bearing surface.

Paper id:E1089

Title: Design of Simple USB Keyboard Based On STM32 Micro-controller

Author: DONG Ming Xiao,SU Ming Tao,ZHU Cui Lan,TIAN Jun Ru and LU Meng Meng

Abstract: The basic principles of USB peripheral interface of STM32 micro-controller is introduced, the main function of each file of the basic structure in standard peripheral library and USB firmware library are analyzed in this paper. The files of clock, interrupt, input/output are modified based on standard peripheral library of the STM32 micro-controller and examples in the USB firmware library to realize the keyboard input function. A report descriptor of the simple USB keyboard is added to the USB firmware library. A simple USB keyboard is designed to effectively realize the one-way communication between the USB keyboard and the computer.

Paper id:E1090

Title: Scene Modeling and Driving of a Visual Simulation System

Author: DONG Ming Xiao,ZHU Cui Lan,SU Ming Tao,TIAN Jun Ru and LU Meng Meng

Abstract: This paper designed the design scheme of a visual simulation system for tower cranes, and described the methods of modeling scene and manufacturing texture according to the

characteristics of Multigen Creator software and Vega virtual software. The five model optimization techniques including levels of detail technique, instancing technique, removing redundant faces, billboard technique and external reference were discussed in the modeling process. In order to improve system running speed, the methods of reducing the face number of the models and save memory spaces were investigated. Scene driving was realized in programming environment of VC++ software. Finally the scene modeling and driving of visual simulation system for tower cranes were completed.

Session:2

May 12, 2012, 10:15—12:00

Paper id:112

Title: Accurate measurement of CTE of aluminum alloy 7050-T7451 and the impact on thermal deformation analysis

Author: Fulai Sun, Jie Sun,Jianfeng Li, Liangyu Song,Yuguo Luo

Abstract: Linear expansion coefficient (CTE) is one of the important thermal parameters for materials, which has a great influence on the thermal deformation analyzing. Thermal Mechanical Analysis (TMA) is adopted to measure the CTE of pre-stretched aluminum alloy sheet 7050-T7451 in three vertical directions. The mathematical functions of CTE of aluminum alloy 7050-T7451 are established, which is with three directions and reflect the influence of the temperature. A comparison between the accurate CTE data and the CTE from reference is carried out .The reason of the CTE variation of aluminum 7050-T7451 with temperature also been explained qualitatively.

Paper id:69

Title: Quenching of Ceramic Coated Steels by Scanning Laser

Author: Hirotaka Tanabe, Keiji Ogawa, Yui Izumi, Takuya Saraie, Mitsuhiro Gotoh, Hideki Hagino,Takuto Yamaguchi

Abstract: In our previous study, it has been shown that improvement of the adhesive strength and substrate hardness of ceramic coated steels without compromising the film hardness can be achieved by applying laser quenching. In the present research, in order to quench a larger area of ceramic coated steel uniformly and efficiently, a high power galvano-scanner equipped with a diode laser was used in the laser heat treatment process. The scanning laser irradiation conditions to achieve uniformly quenched substrates without any surface damage were investigated for 3 kinds of ceramic-coated steels: CrAlN, TiAlN and CrN. The film hardness and adhesive strength of the laser irradiated regions were evaluated. It is shown that scanning laser quenching after coating effectively improved the mechanical properties for larger area of ceramic-coated steels.

Paper id:3

Title: Functionalization of ZnO nanowires for potential p-nitrophenol sensing applications

Author: Anurag Gupta, Bruce C. Kim, Eugene Edwards, Christina Brantley, Paul Ruffin

Abstract: In this work, we demonstrate the functionalization of zinc oxide nanowires with carboxylic acid moieties and investigate their potential application as p-nitrophenol sensors. First, synthesis of high quality zinc oxide nanowires along with appropriate characterization results is discussed. Subsequently, oleic acid, as a model system, is used to examine functionalization behavior of nanowire surface. Vibrational spectroscopic techniques are employed to determine

nature of bonding and orientation of oleic acid molecule at nanowire surface. Photoluminescence properties of modified- and unmodified ZnO nanowires with oleic acid were investigated. Based on these results, an appropriate receptor capable of sensitive optical detection of p-nitrophenol is proposed. In addition, results on sensing mechanism of the receptor based on fluorescence quenching are reported, which highlight the capability of selective and sensitive detection of p-nitrophenol analyte using the receptor.

Paper id:93

Title: Comparison between the RCF performance of TiN- and TiO2-laser coated Ti64 bearings

Author: Justyna Rozwadowska, Edson Costa Santos, Katsuyuki Kida, Takashi Honda, Yuji Kashima and Ryo Matsumoto

Abstract: The present work is a comparison between the rolling contact fatigue (RCF) of laser processed titanium bearings by using a scanning Nd:YAG Q-sw laser. TiN and TiO2 layers were produced on Ti6Al4V (Ti64) in a closed chamber in nitrogen and air atmosphere, respectively. The average thickness of the layers was 2 m in case of TiN and 0.8 m in case of TiO2. Both non-coated and coated bearings were RCF tested in under-water conditions and it was found that laser processing greatly improved their wear resistance and load capacity. Almost 50-fold and 20-fold increase in the wear resistance of the TiN and TiO2-coated bearings was observed after 7.7x106 cycles at a load of 150 N and 600 rpm. The mechanism responsible for this improvement is thought to be the 3-body-contact between the bearing elements and the small TiN and TiO2 debris, coming from the worn coating layers. The maximum load capability of the non-coated, TiN-coated and TiO2-coated bearings were 150 N, 200 N and 600 N. It is concluded that the higher load capacity of the TiO2 compared to the TiN coatings is due to its lower coefficient of friction.

Paper id: T133

Title: Effects of Additives on Semiconduction Transformation in Lead Zirconate Titanate Ceramic Induced by Atomic Hydrogen

Author: Li-Bin Mo, Sen Chen, Dong Guo, Jiang-Li Cao

Abstract: Effects of additives on the semiconduction transformation of lead zirconate titanate (PZT) during atomic hydrogen charging were investigated. The results showed that the resistivity of the samples decreased by seven orders of magnitude with sixty hours of hydrogen charging in electrolytic without additives. Then with further increasing hydrogen charging time, the resistivity decreased continually, however, much more slowly. Scanning electron microscopy (SEM) showed that the surface structures of PZT were changed significantly upon atomic hydrogen charging. Sodium pyrophosphate (Na4P2O7) and Na2EDTA could effectively affect the semiconduction transformation of PZT as well as the surface structure change. Transmission electron microscopy (TEM) and XRD analysis indicated that there was no new substance formed on the surface of PZT upon atomic hydrogen charging.

Paper id: T132

Title: Superabsorbent Hydrogel From Sago Starch:The Effects of Crosslinking Agent on Hermal Stability and Ftir

Author: O. Nurizana, A. Zuraidab, and N. Norhuda Hidayah

Abstract: For several decades, superabsorbent polymer hydrogels had attracted the researcher's attention due to its afforded unique environmental and commercial advantages. This paper reported the study on the effect of cross linker on the sago starch superabsorbent hydrogel (SSH),

prepared via graft co-polymerization method of acrylic acid (AA) onto sago starch (SS). The AA grafted copolymer was obtained via a redox initiator system of ammonium persulfate (APS) and in the presence of N, N' - methylenebisacrylamide (N-MBA) crosslinker. Fourier Transform infrared spectroscopy (FTIR) spectra proved that AA was grafted onto SS. The thermal stability of SSH is increases with the addition of crosslinker.

Paper id: E1022

Title: Design of Composite Brakes Using Knowledge-Based Design Methodology

Author: Rachman Setiawan, Yulianto, and Rochim Suratman

Abstract: In designing modern friction materials that are normally made of composite materials, a more systematical approach is needed in order select the most appropriate composition of raw materials for specific application. Here, knowledge-based design methodology has been used, that consists of: design database generation from experiments, metamodelling, and global optimization processes. The objective function has incorporated the uncertainties introduced in the experiments, so that providing the optmization results with variation. The application of the methodology has been demonstrated to two cases, i.e. train brake and motorcycle brake pad, with sufficiently close results to the targetted values and with the information of the variation.

Paper id: 94

Title: Finite Element Model and Analysis for Micro-cutting of Aluminum alloy 7050-T7451

Author: Fuzeng Wang, Jie Sun and Jun Zhou

Abstract: In this paper, a finite element model with respect to actual state of micro-cutting is established by adopting software of ABAQUS/Explicit. Based on the FE model, the cutting force and specific cutting force with various uncut depth of cut with different cutting edge radius are compared and then analyzed with regard to this simulation. In micro-cutting, the nonlinear scaling phenomenon is more evident with the decreasing of uncut chip thickness. The likely explanations for the size effect in small uncut chip thickness are discussed in this paper.

Paper id: T108

Title: Carbide Distribution Effect on Wear Behavior of Cold Work tool Steels

Author: Liu-Ho Chiu, Huan-Chen Liao, Shou-Chi Lin, Yeong-Tsuen Pan and Horng-Yih Liou

Abstract: The carbide distribution and retained austenite effects in cold work tool steels on their wear behavior are studied using different quenching, tempering and cryogenic processes. Treated specimens were characterized using optical and scanning electron microscopy, hardness measurements, X-ray diffraction as well as wear tests in a block-on-roller method without lubrication.Beside primary carbides being large and non-uniformly distributed in the D2-B specimen, the weight losses of the D2-B specimen (62.4 HRC) quenched and tempered at 200℃ was highest among all tested specimens due to substantial retained austenite in the tempered martensite matrix. With the aid of small and uniform dispersed carbides, the DC53 steel specimen (61.3 HRC) showed less weight loss and exhibited the best wear resistance. The weight loss from cryogenically treated specimens was lower than that of non-cryogenically treated one.

Paper id: E1109

Title: Design of Driving Circuit of GDI Injector and Experiment Verification

Author: Zhou Daofeng,Yu Xiumin,Bao Long,Zhao Lifeng,Qi Wangqiang

Abstract: In order to precisely control the injection responsivity of the Gasoline Direct Injection（GDI）engine，a higher requirement of the injector drive circuit should be achieved[5]. This paper introduces a new design of driving circuit for the injector

of the EA888 engine. the thesis creates asimulation model of BOOST converter circuit using multisim simulation tool, Simulation results show that voltage ripple is less than 10%.The characteristics of GDI injector are measured and analyzed , the feasibility of the driving circuit is verified.

Paper id:132

Title: Fabrication of Membrane-electrolyte Assembly with Nanocomposite for Direct Methanol Fuel Cell

Author: Ho Chang,Mu-Jung Kao,Kuang-Ying Lee

Abstract: This study aims to deal with the preparation of membrane-electrolyte assembly (MEA) of Pt/Ru/C nanocomposite as well as connecting to a direct methanol fuel cell and using PCB process packaging to test the efficiency of the DMFC. The components assembled in DMFC are including anode flow field plates, MEA and current collector.Using PCB boards for the anode flow field plates as well as the electicity collector plates and the type of flow field plate adopts serpentine flow field. For the efficiency of DMFC, liquid motors are used to press methanol mixed solution at specific temperature into DMFC. Besides, the cathode of DMFC adopts natural-breath method with air and uses DC electronic load to activate DMFC to investigate operating voltage and further to set constant voltage to measure current to calculate the efficiency of DMFC. Initial results of I-V curve show that self-developed MEA of Pt/Ru/C nanocomposite can enhance around 0.2% current density of DMFC after being assembled like commercial MEA

Session:3

May 12, 2012, 13:30—15:30

Paper id:84

Title: Analysis Design for Assembly by MTM-2 (Methods Time Measurement-2) for Wood Joints in furniture.

Author: Sakkarin Choodoung and Uttapol Smutkupt Smutkupt

Abstract: This research study assembly process of a study of Wood Joints with Motion Time Study MTM-2 (Methods Time Measurement-2) and DFA (Design for Assembly) an assessment of the ability to assembly in the Feeding and Fitting. with LUCAS Assembly Evaluation Method for the results of the assessment and find the good-bad points of the assessment was applied. Wood Joint Index for this analysis is the feeding and fitting should not exceed 2.5The pivot of the three groups in terms of feeding Index did not exceed 2.5The advantages of the assessments, when applied to the wood. In general, the nature of Wood Joints must rely on to tool help in almost all assemble of the joints. Each tool is the difficulty of performing it .And in the Entrance of the parts are in a bad score. Tolerance in the 0.2to 0.3mm at the Wood Joint this is limitation is that the scores of these problems. So both of these topics for Wood Joints may be more table to the assessment more accurate and led to the development process for next time.

Paper id: 70

Title: Surface Crack Growth from Small Indentations in a Silicon Nitride Square Bar under Cyclic Reversed Torsion

Author: Katsuyuki Kida, Takashi Honda, Edson Costa Santos

Abstract: In order to investigate the mechanism of surface cracks in silicon nitride ceramic (HIP-Si3N4) from the viewpoint of shear stress, the authors focused on torsion fatigue testing and observed the crack growth behavior under conditions where the stress ratio was R = - 1. Furthermore the residual stresses around the cracks were measured. Based on these results, mode II growth of surface cracks is discussed and it was concluded that under stress ratio R = -1, surface cracks grow slowly in mode II, for ΔK_{II} less than 3.6MPam1/2
Introduction .

Paper id: 86

Title: Effect of Off-center Magnetization Location on Changes in Magnetic Fields under Single Spherical Hertzian Contact

Author: Katsuyuki Kida, Megumi Uryu, Takashi Honda, Edson Costa Santos and Kenichi Saruwatari

Abstract: Tribological failure of machine components, such as wear and flaking failure is caused by contact stress concentration. However, observation of stress under contact load is a difficult task. Non-destructive methods that can be related to contact conditions are necessary to study and understand the phenomena caused by the contact stresses. In the present work, a scanning Hall probe microscope (SHPM) equipped with a GaAs film sensor was used to observe the three-dimensional magnetic fields in a long square bar specimen (JIS-SUJ2) before and after contact tests at 196N. It was found that the changes in the three-dimensional magnetic fields caused by spherical Hertzian contact are not affected by the location of the magnetization point on the specimen's surface.

Paper id:E1024

Title: Finite element analysis of copper wire bonding in integrated circuit devices

Author: DASTGIR Nauman, PASBAKHSH Pooria, GUO Ningqun, ISMAIL Norhazlina and GOH Kheng Lim

Abstract: Axisymmetric finite element models of copper wire-bond-pad structure for an integrated circuit device were developed to investigate the effects of bonding force, initial bonding temperature, Aluminum metallization thickness, bond pad thickness and free air ball (FAB) diameter on induced stresses in the wire-bond structure. The results show that an increase in bonding force greatly increased the induced stresses in the copper FAB and bond pad (aluminum and silicon). However, a change in bonding temperature while keeping the bonding force constant does not result in an appreciable change in the stress. Similarly an increase in aluminium metallization thickness does not yield appreciable variation in the stress and strain in the bond pad. Over the range of FAB diameters studied it is found that bigger FAB yields smaller stress in the overall structure.

Paper id:E1073

Title: Characteristics of pool boiling heat transfer from sintered surfaces

Author: Mao-Yu Wen,Ching-Yen Ho,Kuen-Jang Jang

Abstract: This study investigated the effect of design parameters on pool boiling heat transfer on the sintered surfaces of a tube. The pool boiling experiments were conducted in saturated, deionized and degassed water. Data were taken at an atmospherical pressure and a fixed heat flux of 41,000 2W/m. In the experimentation, the effects of the sintering pressure, sintering time, sintering temperature, heating rate, and particle size on the boiling heat-transfer coefficient of the sintered surface were investigated using the Taguchi method, and an 515(3)L orthogonal array

table was selected as an experimental plan for some parameters mentioned above. Based on the results of SN (signal/noise) ratio and ANOVA (Analysis of Variance), the optimal conditions of specifications of parameters will be provided. It was found that all the chosen sintering factors have significant effects on the pool boiling heat transfer coefficient. Optimum pool boiling heat transfer coefficient of 5.29 2kW/mK was achieved with a sintering pressure of 2 atmospheres, a sintering time of 2 hr, a sintering temperature of 900 ℃, a heating rate of 5 ℃/min and a particle size of 0.35 mm in a nitrogen container.

Paper id: 88

Title: Observation of Magnetic Fields in Medium Carbon Low Alloy Steel JIS S45C under Point Contact Loading

Author: Megumi Uryu, Katsuyuki Kida, Takashi Honda, Edson Santos and Kenichi Saruwatari

Abstract: In order to understand the phenomena caused by the contact stresses occurring within surface, non-destructive methods that can be related to contact conditions are necessary. The main purpose of this work is to study the relationship between magnetization location and direction, spherical Hertzian contact and changes in the magnetic field asymmetry. In the present work, we used a newly developed GaAs film sensor-equipped scanning Hall probe microscope (SHPM) and observed magnetic fields in tool steel plates before and after contact tests under 196N load, at room temperature in air. Medium carbon low alloy steels specimens (JIS S45C) were used in the experiments. Around the contact test area, changes in 'S' and 'N' poles generated by magnetization using a square magnet block were investigated.

Paper id:55

Title: Improvement of Abrasion Wear Resistance of Ductile Iron by Two-Step Austempering

Author: Prapaporn Silawong, Apichart Panichakul, Sudsakorn Inthidech, Narong Akkarapattanagoon and Usanee Kitkamthorn

Abstract: Abrasion wear rates of conventional and two-step austempered ductile cast iron (ADI) were investigated. Conventional austempering and two-step austempering processes were carried out at 280, 300, and 320°C. Microstructures revealed that higher austemperig temperature resulted in coarser ausferrite and higher volume fractions of blocky retained austenite. The ausferrite in two-step austempered ADI was slightly coarser comparing to the coventional ADI since the temperature was raised by 30°C during austempering. Two-body abrasion wear rates of ADIs were studied using a Suga abrasion wear tester. It was found wear rates of the two-step ADI become significantly lower than those of the conventional ADI, especially when the austempering was carried out at low temperature, i.e. 280°C. Such behavior was due to the strong influence of high carbon concentration in retained austenite eventhough the ausferrite matrix was coarser.

Paper id: 109

Title: Design of railway journal box embedded with FBG sensor to monitor temperature and acoustic emission signal

Author: Hyuk Jin Yoon, Myung-Jun Park, Jung-Seok Kim and Jung-Jun Park

Abstract: Railway journal box is designed to monitor the temperature and acoustic emission signal from the axle continuously. Fiber Bragg gratings (FBG) sensors are embedded inside of the journal box cover. Three types of journal box cover are designed such as front elbow coupler type, side hose type and side coupler type. Sensors and optical fiber are located on the predetermined positions engraved inside of the cover. Optical fiber egresses out of the surface and is protected in the protection tube. Among the three types of journal box cover, the side coupler model could be

used most effectively.

Paper id:10

Title: Study of remote fault diagnosis system to wind generator gearbox Based on DSP

Author: Hongxia Pan and Yang Gao

Abstract: In order to meet the wind generator gearbox remote condition monitoring and fault diagnosis requirements, using TI's C2000 series DSP-TMS320F2812 processor as its core, the wind generator gearbox remote fault diagnosis system was designed, in this paper. The use of TMS320F2812-rich peripheral modules to build the system's hardware architecture, including the analog signals, frequency signals, digital signal data acquisition, and has Ethernet, GSM mobile communications. For wind generator gearbox bearings and gears common faults, using FIR digital filter, FFT Fourier transform, cepstrum, detailed spectral analysis and other methods to extract the fault characteristic information. The combination of extracted feature vectors, input to BP neural network trained for fault classification and identification, derived fault type, location and extent. Tests show that the system can go a long on-line monitoring, and can correctly identify the fault. It has small size, multi-functional, practical and strong features, particularly suitable for wind generator remote on-line monitoring and fault diagnosis.

Paper id: 81

Title: Measurement of Joint Element Transmission Error in a Humanoid Walking Robot

Author: Kiyoto Itakura,Hitonobu Koike,Katsuyuki Kida and Kenji Kanemasu

Abstract: In the present work, a prototype of a joint element to be used in lightweight and compact joints for tall humanoid robots is investigated. The newly developed element consists of a harmonic drive gearing device, a multi axis mechanism and a resin bush. Bushes produced from two kinds of bush materials: poly-ether-ether-ketone (PEEK) and polyacetal (POM) were tested. Furthermore, two testing machines to evaluate the joints were constructed: for the power input-output transmission error measurement and for the investigation of the influence of walking-load on bush wear.

Paper id:125

Title: Research on Boundary Extraction of STL Models based on Genetic Algorithm

Author: Jingbin Hao, Zhongbin Wang, Haifeng Yang and Li Zhongkai

Abstract: To efficiently decompose a large complex STL model, an improved boundary extraction method is proposed based on genetic algorithm. Three curvature parameters (dihedral angle, perimeter ration and convexity) were used to estimate the surface curvature information. Genetic Algorithm (GA) is used to determinate the threshold of feature edge. The discrete feature edges are grouped and filtered using the best-fit plane (BFP), which is calculated by Least Square Method (LSM). Several experimental results demonstrate that the amount of feature edges is about half of the preset threshold method, and useful feature edges were reserved. The extracted feature boundaries can be directly used to decompose large complex models.

Paper id: E1028

Title: Dynamic Scheduling Using Immune Genetic Algorithm for Agile MES

Author: Shuxia Li,Hongbo Shan

Abstract: As a bridge links the upper enterprise planning system and the lower shop floor control system, enormous real-time information interact in shop floor, which poses great difficulty for scheduling of manufacturing execution system(MES). To meet the requirement of MES agility in the volatile information environment, dynamic scheduling becomes one of most widely used

methods. In this paper, a modified immune genetic algorithm which incorporates artificial immune mechanism into genetic algorithm is presented to solve dynamic job shop scheduling problems. Owing to its good solving capability and computing speed, the algorithm could utilize real-time production information to generate predictive and reactive scheduling solutions. At last, the algorithm is applied in a MT10×10 job shop proved to be effective in obtaining better solutions than traditional genetic algorithm.

Session:4

May 12, 2012, 15:50—18:00

Paper id:54

Title: Influence of Laser Heat Treatment on Fracture Strength of Ceramic Thin Film

Author: Hirotaka Tanabe, Keiji Ogawa, Yui Izumi, Tohru Takamatsu, Heisaburo Nakagawa, Takuya Saraie, Mitsuhiro Gotoh, Hideki Hagino and Takuto Yamaguchi

Abstract: In our previous study, it has been shown that improvement of the adhesive strength and substrate hardness of ceramic coated steels without compromising the film hardness can be achieved by applying laser quenching. In the present research, in order to demonstrate further development of this method, the fracture strength of laser-irradiated ceramic thin films (CrAlN, TiAlN and CrN) was investigated by sphere indentation testing. To prevent heat-induced changes in the substrate hardness, a cemented carbide WC-Co rather than steel was used as substrate material. While the fracture strength of each film decreased significantly through furnace heat treatment, it remained almost unchanged in case of the laser irradiated films. Laser quenching has been shown to effectively reduce the fracture strength loss of the ceramic thin films in coated steels.

Paper id: E1055

Title: Maximum Output Operation by Equivalently Field Weakening and Optimal Parameters of BLDC Motor

Author: Komatsu Yasuhiro,Syed Abdul Kadir Zawawi,and Yoshihiko Araki

Abstract: Permanent-magnet brushless direct-current motors are easy to maintain, compared with direct-current motors. Therefore, they are attracting attention. In this paper, the authors discuss a non-salient pole brushless direct-current motors. Usually, the quadrature armature current which contributes to torque generation is supplied in this motor. But, in this case that the source voltage cannot be increased by supplying the direct armature current, that is, equivalently field weakening, a quadrature armature current can be increased. Consequently, the motor torque increases. In the case that the load characteristics are settled, the motor torque can have a maximum Tm by adjusting a direct armature current. At this time the rotational speed and output are maximum also. Tm changes with the change of the motor parameters. Consequently, the motor parameters which maximize Tm are optimal. In this paper, the authors have clarified an optimal parameter determination method considering by the load torque-speed characteristics and, armature resistance by the power factor, and efficiency where the motor has optimal parameters and generates the maximum output. Furthermore, the theory obtained has been confirmed experimentally by the authors.

Paper id: T122

Title: Study of Fatigue Properties of AISI4130 Steel Joined By Upset Welding in Heat Treated

Condition

Author: H.Mollazadeh, R.Nouruzi

Abstract: Resistance upset welding (UW) is a widely used for joining metals parts. In this research, the fatigue properties of AISI4130 steel joined by upset welding in annealed and quenched-tempered heat treated condition are investigated. Microstructure of weld and base metals was studied using optical microscopy. Microhardness, tensile, impact and fatigue tests were performed and the final fracture surface was studied by scanning electron microscopy (SEM). The fatigue resistance is better for tempered martensite base metal than for the ferrite-pearlite and upset welded specimens. Results shows during the welding, proeutectoid ferrite phase forms at the interface which reduce the fatigue strength of welded specimens. Fractography of fatigue and tension welded samples indicated that in all samples fracture occurred in the middle of weld interface. Study of fracture surface of fatigue samples shows that the final fracture mode for welded samples is cleavage.

Paper id: T131

Title: Flexural Properties of Kenaf Sandwich Panel

Author: Zahurin Halim and Siti Khadijah Abdul Rahman

Abstract: This study concerns on effect of varying skin thickness to flexural properties of sandwich panel. The main element of the core structure is kenaf and the skin used in this study is galvanised steel sheet. Skin thickness being used in this research is 1.0 mm and 1.2 mm. In this study, comparing sandwich of skin thickness 1.0 mm and 1.2 mm, result shows that 1.0 mm skin is sufficient as mechanical properties of sandwich decreases and density of sandwich increases as skin thickens.

Paper id: 77

Title: Observation of fisheye cracks around TiN and Al2O3 inclusions in repeatedly quenched high carbon bearing steel

Author: Koshiro Mizobe, Takashi Honda, Hitonobu Koike, Edson Santos, Katsuyuki Kida and Takuya Shibukawa

Abstract: Martensitic high-carbon high-strength SAE 52100 bearing steel is one of the main alloys used for rolling contact applications where high wear resistance is required. Refining the prior austenite grain size through repeated heating is a process commonly used to enhance the material's strength. In this work, the microstructure of repeatedly quenched Ti, N-rich ultra-clean SAE 52100 steel was investigated. The material was melted by an electric furnace and formed by continuous casting and forging, and the crack origin on the fracture surface was investigated. It was found repeated furnace quenching effectively refined the martenstic structure and increased the retained austenite content.

Paper id: 72

Title: Relationship between load, rotation speed and, strength in all - PEEK and PEEK race – PTFE retainer hybrid polymer bearings under dry rolling contact fatigue

Author: Koshiro MIZOBE, Takashi HOND, Hitonobu KOIKE, Edson Costa SANTOS, Katsuyuki KIDA and Yuji KASHIMA

Abstract: The production of bearings is focusing on polymers, such as polyether ether ketone (PEEK), a tough semi-crystalline thermoplastic polymer with excellent mechanical properties and polytetrafluoroethylene (PTFE), a material with low friction coefficient. The purpose of this study

was to establish the properties of hybrid PEEK races – PTFE retainer bearings. Rolling contact fatigue tests were performed in order to investigate the wear properties of such components and the relation between load and rotation speed. It is concluded that by using a PTFE retainer, no wear occurs under thrust load ranging from 200N to 800N at 300rpm.

Paper id:113

Title: Influences of the cutting path about machining performance in manufacturing titanium alloys Ti6Al4V thin-walled components

Author: Chao Sun, Jie Sun and Jianfeng Li

Abstract: The difficult-to-machine property of titanium alloy has been on important subject in the field of manufacture, especially for the thin-walled structure. The material removal amount can reach 95% and even 98%. This paper applies the finite element method (FEM) to evaluate the process of machining. The influences of the different tool paths in rough machining frame structure is studied. The influence of the tool path on the dynamic characteristic in finish machining thin-walled frame structure is also investigated. As a result, the tool path in rough machining will influence the machining efficiency and tool life and influence the dynamic characteristics of thin-walled components in finish machining.

Paper id:73

Title: Microstructure and Mechanical Properties in Ultra-high Strength Steel with Tensile Strength 1000MPa

Author: MA Yu-xi, Guo Bin, Zheng Lin, Song Chang, Liu Changming, TaoJunhui

Abstract: Microstructure and mechanical property variation vs. heat process was investigated by means of metallography and electron microscopy in Ultra-high Strength Steel with tensile strength 1000Mpa.The results show that microstructure variation in the steel with tempering temperature increasing is as follows:tempered martensite□main tempered sorbite and a small amount of M/A, at the meantime, growing in quantities and volume of second-phase, always decreasing in strength, firstly increasing and then decreasing in impact energy and elongation. Study on precipitated mechanism of second-phases, the crystal structure and volume of precipitation was characterized by TEM observation and energy spectrometer.

Paper id: 8

Title: Pre-strained piezoelectric PVDF nanofiber array fabricated by near-field electrospining on cylindrical process for flexible energy conversion

Author: Zong-Hsin Liu, Li-Wei Lin, Cheng-Teng Pan and Zong-Yu Ou

Abstract: In this study, near-field electrospining on hollow cylindrical (NFES) process was used to fabricate permanent piezoelectricity of polyvinylidene fluoride (PVDF) piezoelectric nanofibers. With in situ electric poling, mechanical stretching and heating during NFES process, the pre-strained piezoelectric PVDF nanofibers with high stretchability and energy conversion efficiency can be applied at low-frequency ambient vibration to convert mechanical energies into electrical signals. By adjusting rotating velocity of the hollow cylindrical glass tube on X-Y stage, electric field, baking temperature and carbon nanotube (CNT) concentration in PVDF solution, the crystalline of β phase, polarization intensity and morphology of piezoelectric fiber can be controlled. XRD (X-ray diffraction) observation of PVDF fibers was characterized. With electric field 0.5×107 V/m (needle-to-tube distance 2 mm and DC voltage 5 kV), rotating velocity 400 r.p.m, baking temperature 80 ℃ and 0.03 wt% CNT in NFES process, it reveals a high

diffraction peak at $2\theta = 20.8^{\circ}$ of piezoelectric crystal β-phase structure. Then the array nanofibers were transferred onto a parallel copper electrode by using flexible insulation epoxy/PI film to provide packaging protection. When the sensor was tested under 5 Hz vibration frequency, the maximum induced voltage was 29.4 mVp-p.

Paper id: 67

Title: Observations of Cracks from Microscopic Holes of PEEK Bearings under Rolling-Contact Fatigue in Water

Author: Shunsuke OYAMA,Katsuyuki KIDA, Edson Costa SANTOS,Hironobu KOIKE,Takashi HONDA and Yuji KASHIMA

Abstract: The behavior of surface cracks in PEEK thrust bearings under rolling contact fatigue (RCF) was investigated. Eight small holes were introduced along the bottom race surface, and RCF tests underwater using different loads were carried out. The cracks growing from the holes were observed by using a microscope. It was found that the surface cracks could not be explained by Hertzian crack theory or the 'wedge effect' models. This indicates that the standard theories cannot be generally applied to investigation of PEEK bearings working under RCF in water.

Paper id: 89

Title: Observation of Crack Initiation from Inclusions in Rolling Contact Fatigue Tested Specimens, using a Newly Developed Single-Ball Testing Device

Author: Shintaro Hazeyama, Justyna Rozwadowska, Katsuyuki Kida, Edson Costa Santos, Takashi Honda, Kenji Kanemasu and Takuya Shibukawa

Abstract: In order to obtain experimental data to investigate the mechanism of crack initiation and propagation, an innovative rolling contact fatigue (RCF) machine was developed. Compared to the conventional thrust type RCF machine the new device enables more efficient RCF testing and observation of subsurface cracks. Experimental data and information on inclusions and micro-cracks were obtained through observation by a laser confocal microscope and comparison with stress analysis. The depth of detected crack initiation is strongly correlated with the stress distribution.

Paper id: 111

Title: Microstructure and rolling contact fatigue strength of induction heated AISI 52100 bearings

Author: Edson Costa Santos, Katsuyuki Kida, Justyna Rozwadowska, Takashi Honda, Koshiro Mizobe and Takuya Shibukawa

Abstract: In the present work the microstructure and the rolling contact fatigue properties of induction heated AISI 52100 bearings are investigated. The bearings were heat treated by using a flat coil at 30 kW power and 60 kHz frequency, cooled with water and subsequently tempered for 1 hour at 180 °C. The hardness at the surface of the material was close to 900 HV0.3kgf/15s. The hardening depth of the induction heated sample was higher than 5 mm. The retained austenite content was around 18% at the surface and decreases along with the depth. The samples were rolling contact fatigue (RCF) tested up to 107 and 4.5x107 cycles, at Hertzian stress of 4 GPa. No flaking failure was observed on the bearing races. For tests up to 107 cycles the track size was around 690 □ m and this remained unchanged up to 4.5x107 cycles. The residual stresses at the material surface before testing were close to zero and became highly compressive after the RCF testing. Stress induced transformation occurred at the surface and the retained austenite content after testing decreased to 10%. Induction heating was successfully applied to induce martensitic transformation in AISI 52100 steel and the bearings showed very high fatigue strength under

rolling contact.

Paper id: 90

Title: Early stages of the wear behavior of AISI 440C stainless steel under rolling contact in water

Author: Takashi Honda, Katsuyuki Kida, Edson Santos and Takuya Shibukawa

Abstract: In the present work, rolling contact fatigue (RCF) tests in water were performed on AISI 440C stainless steels under different loading. Each test was interrupted at 3.6×104, 7.2×104, 1.44×105, 2.16×105, 2.88×105 and 2.88×105 Introduction rotating cycles and the wear track at different stages was observed by using a 3D laser confocal microscope. The wear loss at 2100 N was a significantly higher compared to 500 N or 1000 N. The contact surface roughness in samples tested at 2100 N increased during the rolling contact and severe adhesion wear was present at the entire surface. In case of 500 and 1000 N tests, the surface roughness remained low with mild adhesion wear occurring. It is concluded that adhesion force levels are higher under high load rolling contact. They greatly influence the surface conditions and cause high wear loss.

Paper id: 76

Title: Observation of crack propagation in PEEK polymer bearings under water-lubricated conditions

Author: Hitonobu Koike,Katsuyuki Kida,Takashi Honda,Koshiro Mizobe,Shunsuke Oyama,ustyna Rozwadowska,Yuji Kashima and Kenji Kanemasu

Abstract: Radial ball bearings made of metal, ceramics and plastics are commonly used as important components in various types of industrial machinery. Due to the latest markets demands for elements capable of withstanding e.g. corrosive environment, metallic bearings are being gradually replaced by components produced from high performance engineering plastic polymers. In order to investigate the failure mechanism of polymer bearings and further improve their performance in practical applications in an underwater environment, in this research crack propation in Poly-ether-ether-ketone (PEEK) was studied by rolling contact fatigue (RCF) testing under water. Crack propagation in the inner ring raceway surface and subsurface areas of PEEK bearings after testing was observed by a laser confocal microscope. Cracks and flaking failure were found on the bearing raceway surface. From the RCF tests results, it was found that the detected cracks could be divided into three groups: Main Surface Cracks, Semi-circular Cracks and Main Subsurface Cracks. It is concluded that flaking occurs on the inner ring raceway due to the fusion of semi-circular cracks and a main subsurface crack.

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