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FHSS-FSK Modulator Design and Implementation for a Wireless Sensor Transmitter

Gh. Bouzid, H. Trabelsi, Z. Elabed and M. Masmoudi

This study presents a modulator design and implementation for a wireless sensor transmitter. The transmitter architecture presented combines a Binary Frequency Shift Keying (BFSK) modulator, an up conversion mixer, a power amplifier and an 863-870 MHz bandpass filter. The BFSK modulator uses the Frequency Hopping Spread Spectrum (FHSS) technique operating in the European ISM band 863-870 MHz. This modulator is intended for short-range wireless applications, such as the wireless sensors network. The modulator generates a 7 MHz wide single-sideband frequency hopped spread spectrum waveform. This modulator is designed using the Direct Digital Frequency Synthesizer (DDFS), which enables us to generate BFSK signal with the hopping frequencies. Low power DDFS architecture is presented. It uses a smaller lookup table for sine and cosine functions compared with existing systems using a minimum additional hardware. The evaluated Spurious Free Dynamic Range (SFDR) of the proposed modulator is -88 dBc. A modulator IC has been designed in AMS 0.35 μm standard CMOS process technology with a layout chip area of 0.16 mm^2 . A 20-bit frequency control word gives a tuning resolution of 41.29 Hz at 43.4 MHz sampling rate. This modulator consumes 47.7 μW with a 3V supply at 43.4 MHz. (*Trends in Applied Sciences Research 4 (1): 1-13, 2009; doi: 10.3923/tasr.2009.1.13*)

Reduced-Order Sliding Mode Flux Observer and Nonlinear Control of an Induction Motor

O. Asseu, Z. Yeo, M. Koffi, T.R. Ori, G.L. Loum, T.J. Zoueu and A. Tanoh

This study describes an innovative strategy to the problem of non-linear estimation of states for electrical machine systems. This method allows the estimation of variables that are difficult to access or that are simply impossible to measure. Thus, as compared with a full-order sliding mode observer, in order to reduce the execution time of the estimation, a reduced or third-order discrete-time extended sliding mode observer is proposed for on-line estimation of rotor flux, rotor resistance and torque in an induction motor using a robust feedback linearization control. Simulations results on Matlab-Simulink environment for a 1.8 kW induction motor are presented to prove the effectiveness and high robustness of the proposed nonlinear control and observer against modeling uncertainty and measurement noise. (*Trends in Applied Sciences Research 4 (1): 14-24, 2009; doi: 10.3923/tasr.2009.14.24*)

Forest Harvesting Problem in the Light of the Information Measures

P. Rupšys and E. Petrauskas

This study presents a new characterization on optimal harvesting problem. By relying on both Gompertz shape stochastic growth model and the Shannon, Tsallis, Kullback, Fisher information measures, the solution of biologically optimal rotation problem is presented and exemplified. As an present experience a real data set is used from the repeated measurements on permanent sample plots of pine stands in Lithuania. All results are implemented in symbolic algebra system MAPLE. (*Trends in Applied Sciences Research 4 (1): 25-35, 2009; doi: 10.3923/tasr.2009.25.35*)

Artificial Neural Network as a Clinical Decision-Supporting Tool to Predict Cardiovascular Disease

Beatrice Fidele, Jayrani Cheeneebash, Ashvin Gopaul and Smita S.D. Goorah

The aim of the study is to use artificial intelligence tools as a clinical decision support in assessing cardiovascular risk in patients. A two-layer neural network using the Levenberg-Marquardt algorithm and the resilient backpropagation have been used in the proposed artificial neural network. It has been shown how this network is efficient in predicting cardiovascular risk in individual patients by using the Long Beach dataset. The use of this new network seems to better address the prediction of cardiovascular disease at an individual level. (*Trends in Applied Sciences Research 4 (1): 36-46, 2009; doi: 10.3923/tasr.2009.36.46*)

Predictive Determination of the Trajectory of an Electric Discharge

Z. Yeo, M. Koffi, O. Asseu, A. Tanoh, D. Konan and B. Koffi

Some discharge models suppose that the discharge is developed mainly according to an electric field's line. In this study, a computer program is built in order to carry out accurate determination of the electric field's lines. Finite element method is implemented to solve the Laplace equation and then the electric field is derivate. Field's lines are built by successive jumps and their parameters are calculated by a polynomial approximation. Results are successfully compared to empirical formula established by earlier researches in rod to plane geometry. The field's lines

and what could be a discharge line for an aerial insulator are also investigated and discussed. (*Trends in Applied Sciences Research 4 (1): 47-55, 2009; doi: 10.3923/tasr.2009.47.55*)

Investigation of Failure and Corrosion in Pipelines and Tanks used in Ice-Cream Factory: The Case Study

R. Bazargan-Lari and Y. Bazargan-Lari

This study describes the reasons of failure and corrosion in pipelines and tanks used in ice-cream factory located in Soltanabad Industrial Region, Shiraz (Iran). The present research shows that the chloride level of the water is an important factor in determining the resistance of stainless steel due to crevice corrosion. Laboratory research shows that for the majority of natural, raw and potable water with pH in the range 6.5 to 8; crevice corrosion of 304/304L is rare below about 200 ppm of chlorides. Also crevice corrosion of 316 to 316L with the same pH is rare below about 1000 ppm of chlorides. Chemical analysis of the water of industrial region shows that it contains 386.36 ppm chlorides. So, the stainless steel pipeline type 304, which is used in the factory did not have any resistance against the crevice corrosion and rapidly corroded from those points which were more susceptible such as welded zone. Since the pipes were corroded around the welded zones, metallographic studies were conducted in this area which revealed that the welds were not of high quality and contained holes in the welded zones as well as imperfections such as lack of diffusion and incomplete penetration. Finally preventing methods of pipelines corrosion is discussed. (*Trends in Applied Sciences Research 4 (1): 56-61, 2009; doi: 10.3923/tasr.2009.56.61*)

Simulating Fatigue Propagation Life of Martensitic Steel

O.O. Ajayi and J. Ikotun

The linear elastic fracture mechanics equation together with that for stress intensity factor range K , was used to develop a fatigue propagation life model, after substituting parameters of material constants. The model was then employed in creating simulation software which can be used at any time to generate data, make design consideration and predict response to variable loading. This became useful in predicting the life of metal from the point of crack initiation; investigate behaviour to changes in crack sizes and also determine adequate damage tolerance for the metal. (*Trends in Applied Sciences Research 4 (1): 62-67, 2009; doi: 10.3923/tasr.2009.62.67*)

Proximate Composition, Mineral Elements and Anti-Nutritional Factors of *Anisopus mannii* N.E.Br. (Asclepiadaceae)

A.B. Aliyu, A.M. Musa, M.S. Sallau and A.O. Oyewale

Biochemical studies with a view to assess the nutritional potentials of *Anisopus mannii* were carried out by evaluating the proximate composition, mineral elements and anti-nutritional content of the plant. The results showed that the total oxalates, free cyanides, tannins and total cyanides were found to be present at 0.70 ± 0.5 , 6.50 ± 0.41 , 10.55 ± 0.01 and $12.41\pm 7.19\%$, respectively. However, concentration of phytate was very low ($0.017\pm 0.00\%$). Proximate compositions of the plant showed a rich source of crude protein ($8.40\pm 0.17\%$), fats ($8.67\pm 0.63\%$), carbohydrates ($72.57\pm 0.68\%$) and total ash ($10.36\pm 0.22\%$). The plant was also found to contain the following essential minerals: potassium (1700 mg/100 g), calcium (1280 mg/100 g), iron (156 mg/100 g), vanadium (102 mg/100 g), chromium (53.90 mg/100 g), zinc (0.874 mg/100 g), copper (1.43 mg/100 g) and manganese (36.60 mg/100 g). The results of this research indicated that *Anisopus mannii* has nutritional qualities that could provide the users with additional nutrients for enhanced curative process of ill health. (*Trends in Applied Sciences Research* 4 (1): 68-72, 2009; doi: 10.3923/tasr.2009.68.72)

Application of Young Slits Technique: Measurement of the Phase of the Diffracted Field in Optical Domain

D.K. Konan, B.K. Koffi, A. Tanoh, M. Koffi, Z. Yeo, K. Konan and R.K. N'guessan

This study presents a new technique to measure the phase difference between two diffracted fields: The field diffracted by a reference object and the field diffracted by an unknown object. For that we use the interferential technique of Young slits. We measured the phase difference between the diffracted fields of two rods of resin. And knowing the phase of the diffracted field of the reference object helps deducing the phase of the field diffracted by the sample. This setup is simple and it is very strong in the presence of disturbances because both objects are illuminated with the same incident beam. Moreover, this technique allows us measuring the phase of the diffracted field on a wide range of angle so that a high resolution of the image can be obtained. (*Trends in Applied Sciences Research* 4 (2): 73-78, 2009; doi: 10.3923/tasr.2009.73.78)

The Effect of Storage Method on the Vitamin C Content in Some Tropical Fruit Juices

V.O. Ajibola, O.A. Babatunde and S. Suleiman

Loss in vitamin C contents of some fruit juices namely, orange, lemon, lime, pineapple, paw-paw and carrot stored under different conditions was investigated. The juice from the fruit samples were extracted, stored at room temperature ($29\pm 1^\circ\text{C}$) in plastic bottles and in the refrigerator ($4\pm 1^\circ\text{C}$) for 4 weeks. The juices were all analysed for their vitamin C content by oxidation and reduction method. Results revealed that the rate at which vitamin C is lost during storage depends on the type of fruit and the storage method employed. The citrus fruits were found to follow a similar pattern of loss, while other fruits differ from this and among themselves. Loss of vitamin C correlated with pH only for pineapple, pawpaw and carrot, however, this cannot be said to be the controlling factor. *Bacillus subtilis* and *Candida* sp. were isolated from all the juices under both storage conditions, except for orange juice. (*Trends in Applied Sciences Research* 4 (2): 79-84, 2009; doi: 10.3923/tasr.2009.79.84)

The Application of Factor Analysis and Artificial Neural Networks in Predicting Spring Precipitation by Means of Climatic Parameters of the Upper Levels of Atmosphere

M.H. Nokhandan, G.A.F. Ghalhary and M. Mousavi-Baygi

This research aims to study the relationship between climatic large-scale synoptic patterns of the upper levels of atmosphere and rainfall in Khorasan-e Razavi Province. Artificial neural networks and factor analysis were used in this study to predict rainfall in the period between April and June in the province. At the first the relationship between average regional rainfall and the changes in synoptic patterns including the temperature of 700 mb level, the thickness between 500 and 1000 mb levels and the relative humidity of 300 mb level were analyzed. In the selection of these regions, we have considered the effect of synoptic patterns in these regions on the rainfall in the northeast region of Iran. Then, artificial neural networks model for the period 1970-1997 were taught. Finally, the rainfall in the period 1998-2007 has been predicted. The results show that artificial neural networks can predict rainfall with reasonable accuracy in all years. The root mean-square error of the model was 5 mm. (*Trends in Applied Sciences Research* 4 (2):85-97, 2009; doi: 10.3923/tasr.2009.85.97)

Adaptive Control of Chaotic Rössler System via Synchronization

H. Fatehi Marj, R. Asgharian and N. Pariz

In this study, using synchronization approach, chaos control for Rössler system is investigated. Based on essential structure of synchronization approach and using bifurcation diagram, periodic Rössler systems or master systems for both period-one and period-two orbits are found. Adaptive nonlinear feedback method is used to synchronize chaotic slave system with periodic master ones. Stability conditions are discussed analytically based on Lyapunov theorem and numerical simulation results are presented. The proposed method could control the chaotic system with unknown parameters very well. (*Trends in Applied Sciences Research* 4 (2): 98-106, 2009; *doi*: 10.3923/tasr.2009.98.106)

Methoxy Poly (Ethylene Glycol)-*b*-Poly (D, L-lactide) Films for Controlled Release of Ibuprofen

T. Phromsopha and Y. Baimark

Biodegradable films of methoxy poly (ethylene glycol)-*b*-poly (D, L-lactide) diblock copolymers (MPEG-*b*-PDLL) containing drug were prepared by solution casting of MPEG-*b*-PDLL and drug in dichloromethane. Ibuprofen was used as a poorly-water soluble model drug. Influences of MPEG-*b*-PDLL/drug ratio and film thickness on ibuprofen-loaded film characteristics and drug release behaviors were investigated. The hydrogen bonding between MPEG-*b*-PDLL and drug were detected from FTIR analysis. From FTIR and differential scanning calorimetric results indicated that the ibuprofen was well distributed throughout the MPEG-*b*-PDLL film matrices. The drug release rates increased as the drug ratio increased and the film thickness decreased. The drug release from the films occurred by drug diffusion mechanism. (*Trends in Applied Sciences Research* 4 (2): 107-115, 2009; *doi*: 10.3923/tasr.2009.107.115)

Some Chemical and Morphological Properties of Juvenile Woods from Beech (*Fagus orientalis* L.) and Pine (*Pinus nigra* A.) Plantations

M. Akgül and A. Tozluoğlu

In this study, carefully selected test materials were taken from juvenile wood *Pinus nigra* and *Fagus orientalis* growing naturally in Turkey. The aim of this research

is to determine the chemical and morphological properties of the wood fiber of the *Pinus nigra* and *Fagus orientalis* and the suitability of these properties for pulping. Eight sample trees were taken as four pieces for each species which were collected from Duzce-Dariyeri-Yaylagol region. The test samples were taken from certain parts of tree stems. In these tests, fiber length, fiber diameter, lumen dia cell wall thickness were measured. The felting power, elasticity coefficient, rigidity coefficient, Runkel's proportion, Muhlsteph's proportion and F-ratio were calculated from the wood fiber morphological properties and the effects of these properties on pulp strength properties were investigated. According to the results of this study, it was found that the pine and beech are/aren't suitable for pulping. (*Trends in Applied Sciences Research 4 (2):116-125, 2009; doi: 10.3923/tasr.2009.116.125*)

A Comparative Study of Neural Networks and Non-Parametric Regression Models for Trend and Seasonal Time Series

Dursun Aydin

In this study, we will investigate and compare the performance of some forecasting methods for time series with both trend and seasonal patterns. The forecasting performance has been compared with six models and these include: Auto Regressive Integrated Moving Average (ARIMA), Smoothing Spline Model (SSM), Regression Spline Model (RSM), Additive Regression Model (ARM), Multi-Layer Perceptron (MLP) and Radial Basis Function (RBF) network models. The SSM, RSM and ARM are called as non-parametric regression models, whereas MLP and RBF are known as artificial neural network models. For these models, we conducted a comparison based on actual data sets, the number of tourist coming to Turkey. The empirical results obtained have shown that MLP performed better than other models. In addition, the SSM can be considered as an alternative to MLP. (*Trends in Applied Sciences Research 4 (3): 126-137, 2009; doi: 10.3923/tasr.2009.126.137*)

Spatial Association of Copper Mineralization and Faults/Fractures in Southern Part of Central Iranian Volcanic Belt

R. Derakhshani and A. Mehrabi

To provide guides for exploration of porphyry copper mineralization at a district scale, we examine the spatial association between known copper deposits and

strike-slip faults/fractures in South central Iranian volcanic belt. Studying of aerial photographs and preparing of photogeological map of the study area, beside various image processing techniques, helped us to reveal faults/features of this area. Field reconnaissance and local detailed mapping followed to corroborate the evidence. The integration of remote sensing and field checking resulted in preparing geological map of the area. After converting the map to the raster one, buffers around the faults/fractures are extracted. Then the spatial associations between the porphyry copper deposits and strike-slip faults/fractures are quantified using weights of evidence modeling. The porphyry copper occurrences are associated spatially with strike slip faults/fractures within distances of 1 km. In addition, based on these observations local strike slip faults/fractures related to regional strike slip faults systems are the most important foci for emplacement of copper-bearing porphyritic intrusions in the study area. Taking advantages of GIS, remote sensing technology and weights of evidence modeling, it is detected that the most concentrated place of porphyry copper in southern part of central Iranian volcanic belt is among the faults/fractures and through 1 km around them. (*Trends in Applied Sciences Research* 4 (3): 138-147, 2009; doi: 10.3923/tasr.2009.138.147)

Investigation on Bulk Density of Deposited Sediments in Dez Reservoir

H. Samadi Boroujeni, M. Fathi-Moghadam and M. Shafaei-Bejestan

In this study, the bulk density of fine sediments deposited behind Dez dam (near dam body) in Iran has been quantified by field investigation (one borehole closed to power intakes) and available empirical methods. Dez dam is located in the Southwest of Iran, completed in 1963, with the height of 203 m and original reservoir volume of 3315 million m³ (MCM). The result of bathymetry survey in 2003 show that the storage volume of the reservoir has been reduced to 2600 MCM by sedimentation and sediment level at upstream of the dam body has been raised to 256 m, i.e., only 14 m below the hydropower intake at elevation of 270 m. The field data from a deep borehole at bottom of reservoir close to the hydropower intakes have been collected and analyzed. Results show that the empirical methods proposed by Lane and Miller underestimate the bulk density of sediments by about 43 and 46%, respectively. This shows that the empirical methods can not be applied for predicting bulk density of fine sediments. A new set of equations is developed for predicting the bulk density of fine sediments. (*Trends in Applied Sciences Research* 4 (3): 148-157, 2009; doi: 10.3923/tasr.2009.148.157)

Evaluation of Horizontal and Vertical Illuminance Models against Measured Data in Iran

S. Shekari. S and R. Golmohammadi

This study was undertaken to evaluate performance of three models of horizontal and two models of vertical illuminance based on measured data in Iran. Measurement of horizontal and South oriented vertical illuminance was carried out at three stations of Eshtehard, Hamadan and Kerman over 15 days at one hour intervals between 12 July and 1 August 2007 from 9 a.m. to 3 p.m. Synchronously calculation of solar altitudes and global horizontal illuminance carried out utilizing equations proposed by Illuminating Engineering Society of North America (IESNA) for measuring period. Two localized models entitled Solar altitude model and IESNA model in conjunction with the model of Robledo was adopted to predict horizontal illuminance. Also for predicting of South oriented vertical illuminance, a localized model based on IESNA equations in conjunction with a model of Ruiz were taken in to account. Mean measured and predicted horizontal values by three models found to be 96 KLx and 107.3-108.7 KLx, respectively. Among three horizontal models the model of IESNA (MBD = -1.26, RMSD = 10.25) performed best and the model of solar altitude performed worst. Mean measured and predicted values of vertical illuminance by two vertical models found to be 33.59 and 25.71-32.19, respectively. The IESNA model (MBD = -1.4, RMSD = 0.2) performed better than the model of Ruiz. Respective mean monthly predicted horizontal and vertical illuminance exceeded 63 KLx for 50 and 0.96% of working year indicating high daylight availability on horizontal and vertical planes in Iran. (*Trends in Applied Sciences Research* 4 (3): 158-166, 2009; doi: 10.3923/tasr.2009.158.166)

Daylight Availability and Energy Conservation in Industrial Parks of Tehran

S. Shekari S. and R. Golmohammadi

This study presents results of a study on estimation of daylight availability on horizontal and south oriented vertical surfaces as well as energy saving in industrial parks of Tehran by daylighting. Beyond our natural affinity for daylight, it is much more effective than electric lighting at entraining the circadian system because the circadian system responds only to high levels of blue light, such as those found in

daylight. Horizontal and vertical illuminances were calculated for three established stations by equations of Illuminating Engineering Society of North America. Synchronically illuminances were measured over 15 days between 12 July and 1 August 2007 to confirm calculated data. The correlation of measured and calculated values was reasonable ($r=0.703$). Regression models were developed between measured and calculated values ($r^2 = 0.8$). Horizontal and vertical illuminances were predicted for 11 industrial parks of Tehran during a working year (294 days) by fitted models. The minimum, maximum, mean and SD of predicted horizontal values found to be of 12.45, 108.12, 66.48 and 24.71 KLx, respectively. Considerable frequency of occurrence of horizontal illuminance in all places (9.7%) was related in values more than 100 KLx. Additionally it was revealed that in 55% of working year daylight could be sufficient for maintaining indoor standard illuminance of 500 Lx. Results of this study suggest high daylight availability and high potentiality of energy conservation in Iran. (*Trends in Applied Sciences Research* 4 (3): 167-174, 2009; **doi**: 10.3923/tasr.2009.167.174)

Utilization of Local Raw Materials for the Production of Commercial Glasses

Omar A. Al-Harbi and Mohammad M. Khan

The main objective of this study was to prepare transparent soda-lime-silica and borosilicate glasses utilizing locally available raw materials. Major source of oxides for the preparation of different various glass batches are silica sand, limestone, magnesite, clay, feldspar, granite and nepheline syenite. The mean chemical composition of soda-lime-silica glasses consisted of SiO₂ (70.72%), CaO (10.78%) and Na₂O (16.67%) and that of borosilicate glass consisted of SiO₂ (71.83%), Na₂O (5.30%) and B₂O₃ (13.26%). The Coefficient of Thermal Expansion (CTE) ranged from 93.64 to 110.78×10⁻⁷°C for soda-lime-silica glass and from 44.85 to 73.25×10⁻⁷°C for borosilicate glass in the Temperature range of 25-300°C. A strong correlation was observed between the batch and among other glass parameters such as chemical composition, melting temperature, color, density, microhardness, chemical suitability and coefficient of thermal expansion. The multivariate analysis of major oxides and the different properties of prepared glasses suggest that most of these properties depended on the composition of glasses. The properties of the prepared glasses highlighted the potential of local raw materials for glass industry in the Kingdom. (*Trends in Applied Sciences Research* 4 (4): 176-187, 2009; **doi**: 10.3923/tasr.2009.176.187)

Trends of Rotational Speed on Engine Performance for Four Cylinder Direct Injection Hydrogen Fueled Engine

M.M. Rahman, M.K. Mohammed and R.A. Bakar

This study was addressed the effect of speed on engine performance for four cylinder direct injection hydrogen fueled engine. GT-Power was utilized to develop the model for direct injection engine. This model was employed one dimensional gas dynamics to represent the flow and heat transfer in the components of engine model. Sequential pulse injectors were adapted to the inject hydrogen gas fuel within the compression stroke. Air-fuel ratio was varied from rich limit (AFR = 27.464) to a lean limit (AFR = 171.65). The rotational speed of the engine was varied from 1000 to 6000 rpm. The obtained results seen that the engine speed are greatly influence on the Brake Mean Effective Pressure (BMEP), Brake Specific Fuel Consumption (BSFC). It can also be seen that the decreases of BMEP with increases of engine speed, however, increases the brake specific fuel consumption. The brake thermal efficiency increases nearby the richest condition and then decreases with increases of engine speed. The optimum minimum value of BSFC occurred within a range of AFR from 38.144 ($\phi = 0.9$) to 49.0428 ($\phi = 0.7$) for the selected range of speed. The higher volumetric efficiency emphasizes that the direct injection of hydrogen is a strong candidate solution to solve the problem of the low volumetric efficiencies of hydrogen engine. Maximum brake torque speed for hydrogen engine occurs at lower speed compared with gasoline. The present contribution suggests the direct injection fuel supply system as a strong candidate for solving the power, torque and abnormal combustion problems. (*Trends in Applied Sciences Research* 4 (4): 188-199, 2009; doi: 10.3923/tasr.2009.188.199)

The Effect of Frequency on the Cyclic Strain Accumulation of Plain Stainless Steel Pressurized Cylinders Subjected to Dynamic Bending Moment

S.J. Zakavi, M. Zehsaz and M.R. Eslami

The aim of this study is to evaluate the effect of frequency on the ratchetting behavior of plain stainless steel pressurized cylinders that may be used in the power plant components. The cylinder is subjected to an internal pressure (calculated as the design pressure for each cylinder) and alternately bending moments at different frequencies typical of seismic events. Ratchetting of the cylinder wall has been observed and recorded in the hoop direction. The nonlinear

isotropic/kinematic (combined) hardening model is used to evaluate the ratchetting. Finite element analysis which models the cylinders under above mentioned loads and combined hardening model is applied to investigate the ratchetting. Stress-strain data and material parameters have been obtained from several stabilized cycles of specimens that are subjected to symmetric strain cycles. The results show that initially, the calculated rate of ratchetting is large and then decreases with the increasing of cycles. Also, the ratchetting data using FE analysis show the hoop strain ratchetting decreases with the increasing of frequencies and spacing from the resonant frequency. (*Trends in Applied Sciences Research 4 (4): 200-215, 2009; doi: 10.3923/tasr.2009.200.215*)

Effect of Milling Parameters on Frictions when Milling Hastelloy C-22HS: A FEM and Statistical Method

K. Kadirgama, M.M. Noor, M.M. Rahman, K.A. Abou-El-Hosseini, B. Mohammad and H. Habeeb

This study was developed the Finite Element Model (FEM) and Response Surface Method (RSM) to investigate the effect of milling parameters on frictions when milling Hastelloy C-22HS. This study gain better understanding of the friction distribution in metal cutting process. The RSM was used to minimize the number of simulation. The contour plot from RSM shows the relationship between input variables including the cutting speed, feed rate and axial depth and responses including the friction coefficient, friction angle, friction stress and friction force. Feed rate, axial depth and cutting speed play major role to generate high friction coefficient, friction angle, friction stress and friction force. When all the variables at highest value the friction stress become larger, on the other hand reduce the feed rate and increase other variable, it cause high friction coefficient, angle and force. The combination of numerical analysis and statistical method are very useful to analysis the distribution of friction in milling. It is suitable to use middle value of cutting speed, feed rate and axial depth when milling same type of materials. (*Trends in Applied Sciences Research 4 (4): 216-228, 2009; doi: 10.3923/tasr.2009.216.228*)

Geologically-Constrained Fuzzy Mapping of Porphyry Copper Mineralization Potential, Meiduk District, Iran

R. Derakhshani and A. Mehrabi

In this study the theory of fuzzy sets is developed for geologically-constrained predictive mineral potential mapping. The application of the theory of fuzzy sets

involves multi-class predictor patterns of geological features. Using the spatial association between known copper deposits and structural features of the study area which is provided by weights of evidence modeling, maps of fuzzy membership value for strike-slip fault fractures, batholithic pluton margins, pluton centroids, lithologic formations and hydrothermal alteration units are provided. After combination of these layers, zones of porphyry copper potential are provided by using fuzzy gamma operator. This method for geologically-constrained predictive mineral potential mapping indicates that the predicted favorable zones for porphyry copper in the study area comprise 4 areas: good potential (0.35%), moderate potential (0.87%), weak potential (31.9%) and non potential for porphyry copper deposits (66.88%) where some well-known deposits like Meiduk and Sara are located in the favorable potential area. So, the application of the theory of fuzzy sets to mineral potential mapping provides a quantitative yet subjective technique for predicting mineral potential where a number of mineral deposits are known. Also, the application of the theory of fuzzy sets in the generation of geologically-constrained predictive maps of mineral potential can be useful to guide further exploration in the search for undiscovered mineral deposits in the study area. (*Trends in Applied Sciences Research 4 (4): 229-240, 2009; doi: 10.3923/tasr.2009.229.240*)

Influence of Co-Doped Bimetallic Impurities on the Metastable Zone Width and Induction Period for Nucleation of KDP from Aqueous Solutions

S.A. Begum and J. Podder

The results of the influence of co-doped bimetallic Mg(II)-Ni(II), Mg(II)-Co(II), Mg(II)-Li(I) impurities on metastable zone width and induction period for the nucleation of KDP crystals are discussed in this study. In order to grow bulk crystals with faster growth rates along all the crystallographic directions, the solubility, metastable zone width, induction period and interfacial energy etc., are necessary to know to optimize the growth conditions. Metastable zone width, induction period and interfacial energy have been determined. Interfacial energy has been estimated using the experimentally determined induction period values based on the classical nucleation theory for a spherical nucleus. The presence of co-doped bimetallic Mg(II)-Ni(II), Mg(II)-Co(II), Mg(II)-Li(I) impurities is found to enhance the metastable zone width, induction period, interfacial energy and also minimizes the formation of secondary nucleation. This phenomenon may be attributed due to the absorption of impurities on the surfaces of the growing nuclei. (*Trends in Applied Sciences Research 4 (4): 241-247, 2009; doi: 10.3923/tasr.2009.241.247*)