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SECTION 1

**SYNTHESIS AND
CHARACTERIZATION
OF MATERIALS**

Increasing Fatigue Life of Titanium Alloys for Aircrafts

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Keywords: titanium, alloys, surface preparation, fatigue crack.

Abstract: Fatigue tests on titanium alloys are necessary because aircraft products are subjected in service to thermal cycling modification or to fatigue. The micromechanics techniques are developed to study fatigue crack growth phenomena. There is an increasing demand to study the initiation and growth of cracks under unidirectional loading (fracture toughness). Hydrogen enhances the susceptibility of titanium alloys to cracking especially at increasing oxygen content. Hydrogen concentration measurements were made with the nuclear probe for hydrogen on which a lithium ion beam is incident. Some of the most important methods for location of faults that can produce fatigue crack in the case of aircrafts structures, wheels and engines and control surfaces are test frequencies (eddy current techniques).

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Specific Aspects Concerning the Microhardness of Ceramic Restorative Materials

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Keywords: ceramic materials, microhardness, restorative dentistry, tribology

Abstract. The surface quality of restorative materials applied in dentistry is an important parameter to achieve a good restorative work and in the most cases is crucial for its behavior in relation with the surrounding tissues from oral cavity. Therefore, each study concerning tribological tests on different types of materials recommended for restorative dentistry must be focused on all its specific aspects. In this way, the paper refers to the hardness evaluation for three ceramic restorative materials: D.SING (Ivoclar), VM13 (Vita Vident TN) and GS ceramic on zirconium support.

Laboratory Investigations for Strength Grading of Spruce Timber Elements

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Keywords: timber grading, experimental tests, strength classes, spruce timber for buildings.

Abstract. The paper presents the results of experimental tests and the process by which a batch of spruce timber elements is sorted in a strength class with reliability.

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Testing Procedure for Timber Strength Grading

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Keywords: timber grading, strength classes, standardized procedures.

Abstract. Despite the variability and particularities that the timber reveals, the strength class grading system has been developed to meet the need to correlate structural design standards with quality standards for timber products. The paper presents the standardised approaches for determining the characteristic values of properties for timber products, with the purpose of classifying the material according to the strength classes system presented in European standards.

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Formulation for Stress Intensity Factors and J-Integral Calculation by Eddy Current Testing

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Keywords: Eddy Current Testing, Stress Intensity Factor, J-Integral, Fracture Mechanics.

Abstract: In this paper, we present a method for computing the Stress Intensity Factor (SIF) and J-Integral, by measuring and testing related Eddy currents. In the process, we provide a magnetic vector based formulations for the theoretical set up. Furthermore, we provide relevant applications having theory consistent results.

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Inverse Problems using Neural Networks for Cracks Characterization in Materials

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Keywords: Artificial Neural Network, inverse problems, Eddy Current Testing, Cracks.

Abstract: Inverse eddy current problem using Artificial Neural Networks (ANN) approach for the localization and the classification shape of defects is considered. The task of reconstructing the cracks and damage in the plate profile of an inspected specimen in order to estimate its material properties can be described in this research work. This is accomplished by inverting eddy current probe impedance measurements that are recorded as a function of probe position, excitation frequency or both. In eddy current nondestructive evaluation, this is widely recognized as a complex theoretical problem whose solution is likely to have a significant impact on the characterization of cracks in materials .

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Comparative XRD and Microstructure Analysis on Biodegradable Mg-Si-Ca Alloys

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Keywords: MgCaSi alloys, biodegradable alloys, SEM, XRD.

Abstract: Biodegradable materials are considered to be the third generation of biomaterials. The aim of these biodegradable alloys is to provide healing and tissue regeneration of the bone. In recent years new types of BM, such as Mg-Si-Ca based alloys were developed and are considered promising candidates for implant materials during a limited time. The effect of Si and Ca addition on pure magnesium alloy has been investigated. The results showed the formation of an intermetallic compound Mg₂Si. Morphology of this compound changed to polyhedral shape with increasing Si addition over 3wt%. The purpose of this paper is to investigate morphological and XRD aspects of casted pure Mg and Mg-XSi-YCa (X – 1.5wt%, 5wt%, 10wt% / Y- 0.5wt%, 1wt%, 2wt%) by using optical microscopy, scanning electron microscopy and X-ray diffraction.

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Non-Destructive Vibration Tests on Reinforced Concrete Structures

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Keywords: concrete durability, non-destructive testing, dynamic test, concrete dynamic non-linearity

Abstract. The purpose of this paper is looking at the dynamic response of existing reinforced concrete structures which have possibly sustained various levels of damage, a set of tests need to be identified that will be able to detect damage and quantify the damage if damage exists. In this work it is presented a further study on the effect of damage on the behavior of reinforced concrete beams. In particular, the non-linear behavior of these beams is considered once significant cracking has been introduced, outlining the stage of testing carried out in dynamic field.

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Thermal Studies of Specific Envelope Solutions for an Energy Efficient Building

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Keywords: Energy efficiency, Monitoring, Thermal Transfer, Thermal Bridge, Ψ value, School.

Abstract. This paper presents the design and monitoring scheme of an energy efficient high school building with emphasis on the analysis of constructive and geometric thermal bridges that can affect the overall energy consumption and thermal comfort. The ANTHERM software is used to accurately assess the specific details and determine isotherms, heat flux distribution and the Psi-values (Ψ value) of the sections where different types of materials connect. A monitoring system with temperature sensors installed in the layers of the building envelope elements has been designed in order to compare the obtained values with the real time thermal performances of the envelope elements. The study highlights the influence of the type and thickness of the insulation materials used in the specific constructive details on the overall thermal performance of buildings.

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Investigation of Copper-Silver Solders Properties in Liquid State before Amorphization

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Keywords: brazing, solder, copper, silver, liquid metal properties, kinematic viscosity, temperature dependence, isotherm.

Abstract. The temperature and concentration dependences of kinematic viscosity of alloys of Cu-Ag system with Ag content to 99 mass % in liquid state have been studied. It has been found that heating above certain critical temperatures leads to transform the melt to equilibrium state. The kinematic viscosity of the Cu-Ag melts are extremely depend from silver content in the alloy. The new regime of amorphous ribbon production is selected. Proposed regime leads to increasing of microhardness and weld strength on 10 % and corrosion resistivity on 15 %.

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Relaxation Processes Features of Glass-Forming Melts on the Basis of Copper

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Keywords: Amorphous materials, amorphous solder, liquids, nanotechnology, metals industry, alloys, fluids, entropy, photodiodes.

Abstract. Two samples of industrial alloys on the basis of copper are experimentally studied. These alloys are used for production of amorphous solders. The main studied property is kinematic viscosity of metal melt in a liquid state. Data of viscosity dependences from temperature when heating and the subsequent cooling are obtained. Besides, viscosity dependences at constant temperatures from time are received. On viscosity dependences from temperature, for the same samples, abnormal sites and a divergence of curves of heating and cooling are found. On viscosity dependences from time, at a constant temperature, instability is found. The conclusion is drawn that the revealed features are connected with complexity of relaxation process of the studied fusions.

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Study Regarding the Influence of Different Antiseptic Mouthwashes on Surface Roughness of Traditional Glass Ionomer Cements

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Keywords: glass ionomer cement, antiseptic mouthwash, surface hardness.

Abstract: The aim of the study was to evaluate the surface hardness of two different traditional glass ionomer cements after their exposure to two commercial oral rinsing solutions. Fuji IX GP (GC Corporation, Tokyo, Japan) and Ketac Molar Easymix (3MESPE, Germany) were used in the study. Twenty-one cement samples of each material were split in three groups. In control group the samples were stored in artificial saliva (AFNOR NF S90-701) for 14 days. In groups 2 and 3 the samples of each material were immersed in Listerine and in Corsodyl two times on a day for 14 days. Between the immersion periods the samples were stored in artificial saliva. The samples were subjected to microhardness evaluation using digital microhardness tester (Micro-Vickers Hardness System CV-400DMTM, CV Instruments Namicon). Significant results were obtained when compared the surface hardness of both glass ionomer cements after their immersion in Listerine and in Corsodyl to control group. The surface hardness of Fuji IX in control and in study groups was significantly higher when compared to Ketac Molar Easymix. In the conditions of the study, Listerine and Corsodyl decreased the surface hardness of Fuji IX GP and Ketac Molar Easymix glass ionomer cements.

Assessment of Synthetic Quenching Media for Hardening

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Keywords: quenching cooling medium, emulsified oil, heat transfer coefficient, cooling rate, cooling curve.

Abstract. For a number of methods used in the cooling heat treatment technique, are required quenching media with cooling rate lower than that of water and larger than that of oil. This can be achieved in industrial practice by using the synthetic quenching type media like gels or emulsions. The synthetic quenching coolants offer advantages such as non-flammability, safety of use and low cost price. The cooling medium to be tested is emulsifiable oil dissolved in water at various concentrations and the testing temperature is 50°C. In the paper were measured cooling curves for specified synthetic media and calculated for the same media the cooling rate variation and heat transfer coefficient on intervals. The experimental data were compared with those obtained from traditional media: water and heat treatment oil TT 50.

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Corrosion Behavior in Saline Medium for a Cu-Zn Casting Alloy

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Keywords: brass, cast alloy, corrosion, microstructure.

Abstract: The paper present aspects about the structural modification of CuZn alloy obtained by casting and used to manufacture the housing which works in corrosive liquid mediums. The analyzed alloy has a chemical composition determine by spectral quantitative analysis, with an optic spectrometer type Foundry Masters, using cooper analysis base. The structural modifications, both in cast state, also after corrosion studies, have highlighted by SEM, at 500x and 2000x magnitude. The experiments were made on samples, with specific dimensions for each analysis.

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Friction and Wearing Behaviour of Sintered Composites Made from Copper Mixed with Carbon Fibers

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Keywords: copper, carbon fibers, sintered composites, friction coefficient, wear speed.

Abstract. This paper presents a study regarding friction and wear compartment of sintered composite materials obtained by mixture of copper with short carbon fibers. Sintered composites are gaining importance because the reinforcement serves to reduce the coefficient of thermal expansion and increase the strength and modulus. In case of composites form by carbon fiber and copper, the thermal conductivity can also be enhanced. The combination of low thermal expansion and high thermal conductivity makes them very attractive for electronic packaging. Besides good thermal properties, their low density makes them particularly desirable for aerospace electronics and orbiting space structures. Compared to the metal itself, a carbon fiber-copper composite is characterized by a higher strength-to-density ratio, a higher modulus-to-density ratio, better fatigue resistance, better high-temperature mechanical properties and better wear resistance. Varying the percentage of short carbon fibers from 7,8% to 2,4%, and the percentage of copper from 92,2% to 97,6%, five dissimilar composite materials have been made and tested from the wear point of view. Friction tests are carried out, at room temperature, in dry conditions, on a pin-on-disc machine. The friction coefficient was measured using abrasive discs made from steel 4340 having the average hardness of 40 HRC, and sliding velocity of 0,6 m/sec. The primary goal of this study work it was to distinguish a mixture of materials with enhanced friction and wearing behaviour. The load applied on the specimen during the tests, is playing a very important role regarding friction coefficient and also the wearing speed.

The pozzolanic activity level of powder waste glass in comparisons with other powders

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Keywords: Pozzolanic activity, cementitious composites, powder waste glass, SEM, XRF.

Abstract. In order to streamline the mixes of concrete with powder waste glass as small as < 0.250 mm, a postdoctoral program objective was to test the activity rate of its pozzolanic reaction, through various methods and by comparing it with other powders reactions in a standardized cement composition. The first method was to determine the compressive strength of cement mortars, partially substituted by glass powder, silica fume, ash and clay. The second method was determining the chemical composition of the powder with fluorescence X-ray, XRF type. The third method, was based on fragments of mortar studied and subjected to microscopic observations – SEM determination (scanning electron microscopy) to investigate the microstructure of the raw material.

Fire Resistant Properties of Geopolymers: A Review

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Keywords: Geopolymers, inorganic, fire resistant, thermal properties.

Abstract. This paper presents fire and thermal properties on geopolymer binders, composed of metakaolin, slag and fly ash as precursor. Geopolymers are inorganic polymeric materials that are believed being capable to resist heat, high temperature and fire. Based on the previous researches, geopolymers offer a feasible alternative to fire resistance applications and with further deep studies, it has great potential to be fabricated for engineering applications.

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- [3] P. Chindapasirt, T. Chareerat, V. Sirivivatnanon, Workability and strength of coarse high calcium fly ash geopolymers, *Cem. Concr. Compos.* 29(3) (2007) 224-229.

Synthesis of Alum from Discarded Aluminium Beverage Cans

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Keywords: Aluminium, beverage cans, alum, recycling, yields, crystallization.

Abstract. This study provides a chemical process that recycles waste aluminium cans to alum crystals that has plenty applications in industry today. The study was performed with concentrated acidic and alkaline solution containing principal components K^+ and SO_4^{2-} ions. It involved the dissolution of aluminium can in KOH solution, neutralization by H_2SO_4 solution and cooling crystallization to produce alum crystals. Emphasis was placed on the percentage yield of alum and recovery of aluminium from waste aluminium can to useful product. The result obtained the highest yield of 80% when 1.5M of KOH solution and 9M of H_2SO_4 solution were used with 5 g of aluminium beverage cans. When the concentration of KOH and H_2SO_4 solution was increased, the yield of alum production was also increased. It was found that the crystallization process was effective in recovering aluminium in the form of alum from waste aluminium beverage cans.

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Sol-Gel Synthesis and in Vitro Evaluation of Apatite Forming Ability of Silica-Based Composite Glass in SBF

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Keywords: bioactive glass, sol-gel, bio-ceramic material, xerogels, apatite.

Abstract. In this study, xerogel glass based on SiO-CaO-PO₄ was synthesized by a low temperature acid catalysed sol-gel route. The in vitro evaluation of apatite forming ability for the glass was conducted in simulated body fluid (SBF) solution as the glasses were immersed for duration of 1, 7, 24 hours and 7 days. The XRD analysis showed that the glass formed semi-crystalline structure when sintered at 1000°C and consisted of Ca₂O₇P₂ and Ca₂O₄Si phases. Image captured using FESEM showed the apatite-like structures were eventually formed on the glass top surface in small numbers after the glass immersed in SBF for only an hour. The numbers of the apatite structures were continuously grown with the increase period of immersion time. The apatite structure mostly covered on top of the glass surface after 24 hours of immersion and continuously growth into bone-like apatite structure when immersed for 7 days in the SBF. The apatite layer formed on the surface of the glass was confirmed as crystalline structure of hydroxyl-carbonate-apatite (HCA) as revealed by the complimentary results of EDS, XRD and FTIR analysis.

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Preparation of Metal-doped TiO₂ and its Photocatalytic Character under Near-Visible Irradiation

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Keywords: photocatalyst, titanium oxide, metal-doped TiO₂, photocatalytic, humic acid.

Abstract: TiO₂ photocatalysts doped with transition metal elements were prepared using nitrates of Fe, Cu and Zn. And the photoactivity of photocatalysts was investigated by performing an experiment, in which the degradation of aqueous humic acid was studied under near-visible irradiation. To examine the photocatalytic characteristics of the TiO₂ particles, the concentration of dissolved organic carbon and the UV₂₅₄ absorption were analysed. As a result, the metal doped photocatalysts showed a higher photoactivity effect than the synthesized pure TiO₂ and the commercial Degussa P-25 TiO₂ at wavelengths longer than 315nm.

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Development of Fly Ash-Based Geopolymer Lightweight Bricks Using Foaming Agent - A Review

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Keywords: fly ash, geopolymer, foaming agent, properties, and lightweight bricks.

Abstract. Bricks are widely used as a construction and building material due to its properties. Recent years have seen a great development in new types of inorganic cementitious binders called “geopolymeric cement” around the world. This prompted its use in bricks, which improves the greenness of ordinary bricks. The development of fly ash-based geopolymer lightweight bricks is relatively new in the field of construction materials. This paper reviews the uses of fly ash as a raw materials and addition of foaming agent to the geopolymeric mixture to produce lightweight bricks. The effects on their physical and mechanical properties have been discussed. Most manufactured bricks with incorporation of foaming agent have shown positive effects by producing lightweight bricks, increased porosity and improved the thermal conductivities of fly ash-based geopolymer bricks. However, less of performances in number of cases in terms of mechanical properties were also demonstrated.

The Effect of Solid-to-Liquid Ratio and Temperature on Mechanical Properties of Kaolin Geopolymer Ceramic

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Keywords: kaolin based geopolymer, alkaline activator solution, geopolymer ceramic.

Abstract. The effect of solid-to-liquid ratio and temperature on the mechanical properties of kaolin geopolymer ceramics are studied. Kaolin and alkaline activator were mixed with the solid-to-liquid ratio in the range of 0.8-1.2. Alkaline activator was formed by mixing the 12 M NaOH solution with sodium silicate at a ratio of 0.24. Kaolin geopolymer ceramic have been produced by using powder metallurgy (PM) technique. The samples were heated at different temperature started from 900 °C until 1200 °C and the strength were tested. The relative density and flexural strength of sintered sample ranged approximately 84%-95% and 20-90 MPa respectively. The result revealed that the optimum flexural strength was obtained at solid-to-liquid ratio of 1.0 and the samples heated at 1200 °C achieved the highest flexural strength (90 MPa).

Synthesis of Nanosized Silica and Silver-doped Silica Nanoparticles for Heat Transfer Fluids Applications

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Keywords: silica, silver, Stober method, transmission electron microscope.

Abstract. The nanosized silica (SiO₂) with the size less than 100 nm has successfully been prepared by hydrolysis and condensation of tetraethyl orthosilicate (TEOS) via a modified Stöber method at room temperature. The experiment was conducted by controlling the amount of the catalyst used, i.e., ammonium hydroxide (NH₄OH). The morphology observation of the synthesized silica nanoparticles was conducted by using a transmission electron microscope (TEM). It was found that the size of the silica depending on the amount of the catalyst used, with homogenous size ranging from 10 to 360 nm. The doping of silver nanoparticles was done by mixing the synthesized silica with the silver ions (Ag⁺) solutions. Then the sample was annealed for 75 min which results in the nucleation of the silver nanoparticles less than 20 nm onto the silica surfaces, depending on the temperature used.



SECTION 2

**PROCEDURES AND
TECHNOLOGIES
FOR MATERIALS ENGINEERING**

Processing and Superelasticity of Ni-Ti Shape Memory Alloys

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Keywords: Ni-Ti alloys, super elasticity, shape memory, properties.

Abstract. In the paper is shown the study of super elasticity of Ni-Ti shape memory alloys from the point of view of stored energy, strain dependencies and martensitic transformations that influence superelasticity of Ni-Ti shape memory alloys. We also present the influence of temperature and alloy composition on the properties of Ni- Ti alloys after plastic deformation and heat treating.

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Considerations on the Specific Phenomena in Metal Heating when Using Electrolytic Plasma

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Keywords: electrolytic plasma, heat flows, characteristics of VTC and VAC, plasma electrolytic saturation (PES).

Abstract. Discovered in 1930, metal processing by electrolysis processes in aqueous solutions, are being intensely studied starting with 1960, so that now they have a wide diversity and industrial applicability. The present paper illustrates some theoretical considerations regarding specific electrode processes of the aqueous solutions electrolysis and the $I=f(U)$ characteristics of the Me/VGS/E electrochemical system thus establishing the forming conditions of electrolytic plasma (PE). The continuous and stable character of the deposited layer (VGS) and of the shell formed by the electrolytic plasma will contribute to the rapid heating of the metal electrode, under the influence of the three heat flows q_a , q_l and q_s . Plasma electrolytic saturation phenomena (PES) and the formation of oxides on the metal surface (PEO), represent the two main directions of plasma electrolytic deposition (PED).

Considerations Regarding Sandblasting Metal Surfaces Designed for Electric Arc Spraying

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Keywords: cleaning, degreasing, sandblasting, safety measures.

Abstract. In order to ensure adherence of the arc sprayed layer, on the metal substrate, a few specific operations must be performed: initial cleaning, degreasing, roughening, final cleaning and degreasing. At the moment, there are standards which refer to the degree of preparation for processing metal surfaces by spraying. Performing metallic surface preparation operations require compliance with specific health and safety measures and environment protection.

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Preliminary Results on Microstructural, Chemical and Wear Analyze of New Cast Iron with Chromium Addition

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Keywords: cast iron, wear, friction coefficient.

Abstract. A new cast-iron material was obtained by melting in an induction furnace. The material was microstructural and chemical characterized before and after a wear test. We analyze the chemical composition of the material at macro-scale using a Spark Spectrometer and at micro-scale using Dispersive Energy Spectrometer. Microstructure before and after the external solicitations was observed using a Scanning Electron Microscope. We also evaluate the influence of external force on the dendrites microstructural and chemical modification.

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Dry Lubricant Materials Deposited by Magnetron Sputtering and Friction Coefficients Evaluation

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Keywords: monolayer, multilayer coatings; dry lubrication; friction coefficient; ternary composition.

Abstract. Because friction became a more and more important issue regarding its influences on economical trends and technological developments, causing energy waste, pollution and increased costs for production, this research is oriented towards developing new type of coatings (monolayer and multilayer) having dry lubrication properties. Presented work will refer only to friction coefficients variation for tested samples, trying to establish the direct influence of used deposition parameters and settings for obtained analyses results regarding dry lubrication properties and also trying to determine the best recipe for dry lubrication coatings depositions.

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Copper Flow Simulation to Severe Plastic Deformation by Multiaxial Forging

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Keywords: severe plastic deformation, multiaxial forging, simulation.

Abstract. Today, computer numerical simulations take place increasingly trials. The development of computers, increasing data storage capacity and computing speed, led to appearance of specialized software for virtual simulation of most plastics processing procedures. With these programs you can get answers to fundamental problems of plastic deformation: the size and stress distribution within the body, breaking predicting how the material flow, final shape of the product. Copper flow simulation is necessary for predetermination of total plastic deformation force, which is used to choose the machine deformation. Also, flow simulation aims to determine material contact tensions - deformation tools, necessary tension for sizing tool, in this case the active plate, punch and conterpunch.

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Thin Films based on Tungsten Carbide with Binary, Ternary and Quaternary Composition, Obtained by Magnetron Sputtering

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Keywords: tungsten carbide, binary/ternary/quaternary composition, magnetron sputtering, roughness, grain size, electrical conduction.

Abstract. Tungsten carbide is an anorganic compound with very interesting tribology features such as: the highest melting point and hardness values among the known compounds, high elasticity (Young) modulus, high thermal stability on a large temperature range, low chemical reactivity, etc. Magnetron sputtering is the most convenient deposition method for obtaining tribological coatings with binary/ternary/quaternary composition starting from WC commercially magnetron sputtering targets. Roughness and grain size of such coatings were investigated by Atomic Force Microscopy and electrical sheet resistance was investigated by using the Four Point Probe Method with ALESSI head and W electrodes..

Chemical Deposition of Thin Layers on Reinforcing Steel

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Keywords: reinforcing steel; zinc phosphates; coating; corrosion resistance.

Abstract. This paper presents the results of experimental research on the influence of using microcrystalline phosphating process on the OB37 steel used in construction. For this purpose, the samples were immersed in phosphate solution and the structures were characterized using SEM microscope. The results show that the obtained structures, are influenced by pH and immersion time and show a good surface compactity and roughness, which means that the obtained layer on the OB37 reinforcement improves corrosion resistance and adhesion of these reinforcements in the reinforced concrete.

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Influence of Process Parameters on the Properties of TiO₂ Films Deposited by a D.C. Magnetron Sputtering System on Glass Support

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Keywords: titanium oxide, DC magnetron sputtering.

Abstract. In this paper it has been deposited films of titanium oxide (TiO₂), on a support of glass, by a D.C. magnetron sputtering system, by varying the working pressure ($p = 2 \cdot 10^{-3} - 6.5 \cdot 10^{-3}$ mbar) of the substrate temperature on three levels. The obtained layers were investigated and characterized by optical microscopy, Scanning Electron Microscopy SEM, X-ray diffraction and Atomic Force Microscopy. It was observed that, by modifying technological parameters of the process (working pressure and substrate temperature) it is changing the initial orientation of the compounds ((100) turns into (101) or (002)). The AFM analysis has allowed the observation of the fact that the average roughness of deposited films, expressed as RMS, has increased over 98% at the increasing of sputtering pressure from 2 10⁻³ mbar to 6.5 10⁻³ mbar. SEM analysis showed that the density of the deposit increases with substrate temperature. The granulation of the films obtained, presents an increasing trend with the variation of process parameters.

Researches Regarding the Influence of Technological Parameters on the Alloying Efficiency in Powder Injection Process

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Keywords: powder injection, plume zone, alloying, penetration critical speed, structure.

Abstract. The injection of the powdered materials into molten melts is a common practice in the metallurgical technology of steel refining and alloying. During process development, within the metal bath is formed a mixed three-phase with different structures depending on the parameters of the hydrodynamic injection. The “plume zone” represents a domain inside of the molten metal in which takes place the forming, coalescence and disintegration of the gas bubbles, that penetrate into the molten metal together with the powdered material. The “plume zone” is the primary contact zone between the powdered particles and the molten metal. Inside of contact zone is take place the chemical reactions between the reactive material and the metal bath components. The “plume zone” size, shape and structure are functions of the hydrodynamic parameters of the injection process, the most important being the injection speed. The size of this parameter leads at the appearance of a multitude of possible structures types of the metal bath. These structures dictate the metallurgical process efficiency in defining the steelmaking process and refining of metal bath. In the present paper are investigated and discussed the “plume zone” structures formed during injection with graphite particle of a molten steel bath and the metallurgical results obtained experimentally under the influence of the injection velocity.

Experimental Study of Active Vibration Control of a Flexible Beam System Using Iterative Learning Algorithm

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Keywords: flexible beam, iterative learning algorithm, active vibration control.

Abstract. Experimental studies are conducted on active vibration control using self-tuning proportional integral derivative and self-tuning proportional iterative learning algorithm control schemes to suppress vibration on a flexible beam via real-time computer control. An experimental rig is developed to investigate controller performance when a change in the dynamic behavior of the flexible beam system occurs. The performance of the self-tuning control schemes is validated experimentally and compared with that of conventional control schemes through the use of an iterative learning algorithm. Experimental results clearly reveal the effectiveness and robustness of the self-tuning control schemes over conventional control schemes.

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Utilization of Polishing Sludge (PS) and Bodymill Sludge (BS) Incorporated Into Fired Clay Brick

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Keywords: Bricks, Mosaic sludge, Compressive strength, Density, Shrinkage, Initial rate of suction .

Abstract. Brick manufactured from mosaic sludge and clay is investigated considering to the huge volume has that been produced and the effect towards the environment. In this study, the research attempt to reuse two types of mosaic sludge from polishing (PS) and bodymill (BS) process conducted in mosaic industries to be incorporated into fired clay brick. The mosaic sludge is used to replace the raw material of clay up to 10%. In this investigation, the composition and concentration of heavy metal was determined by using X-Ray Fluorescence Spectrometer (XRF). Physical and mechanical properties test were conducted such as compressive strength, shrinkage, density and initial rate of suction. From the results, its shows that brick with 5% PS and BS sludge obtained the highest compressive strength, low density and less total shrinkage compared to other percentages. Nevertheless, all the other properties for all bricks incorporated with different percentages of mosaic sludge were complied with the standard (BS 3291:1985). In conclusion, mosaic sludge (PS and BS) could be an alternative low cost material for brick and at the same time provide an environmental friendly disposal method for the waste.

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Laser Cutting of Coronary Stents: Progress and Development in Laser Based Stent Cutting Technology

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Keywords: Review, Stent, Laser micromachining, Biocompatible, Long pulsed lasers, Ultra-short pulsed lasers, Underwater.

Abstract. Laser cutting is one of the key fabrication technologies applied to coronary stent manufacture. This paper reviews the recent progress in laser-based stent manufacturing, including different type of lasers used, laser interaction with different stent materials, process characteristics and quality/productivity issues.

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Epoxy Hardener filled with Geopolymer Materials for Piping Application: Flexural Properties

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Keywords: Epoxy, geopolymer, fly ash, white clay, silica sand, flexural.

Abstract. In this study, the effect of geopolymer materials in epoxy hardener was studied under mechanical testing which is using the flexural test. A series of epoxy filled with 10%-30% weight percentage geopolymer materials which are white clay, fly ash and silica sand was prepared. Flexural strength of the epoxy filled geopolymer materials is determined using Instron Universal Testing under flexural mode. It was found that the addition of these geopolymer materials into epoxy at the beginning with 10% weight percentage showing lower flexural strength than epoxy without geopolymer materials filled. However, flexural properties suddenly increased at 20% weight percentage of white clay and fly ash based geopolymer but tend to decrease at 30% weight percentage compared to silica sand based geopolymer which the strength is continuing to decline with the increasing of weight percentage of silica sand. The results indicated that the blending of geopolymer materials in epoxy system can be obtained in this study.

A Review on Mechanical Properties of Geopolymer Composites for High Temperature Application

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Keyword: Geopolymer, Slag, Metakaolin, High Temperature.

Abstract. Geopolymer is cementitious binder that have enormous potential to become an alternative to ordinary Portland cement (OPC). Geopolymer composites have the potential to substantially curb the carbon dioxide (CO₂) emissions. Kaolin, metakaolin, slag and fly ash have been used as the prime materials for forming geopolymers composites. Geopolymers have been studied for the past decade due to its unique properties such as low shrinkage, substantially chemical resistance, and higher fire resistance. The geopolymer offer an innovative for coating application at higher thermal application. Based on historical review, geopolymer materials exhibit resistance to corrosion, abrasion and heat. This paper summarizes some research finding about alkali-activated binders over the past decades along with outlines of the potential of geopolymer composites for high temperature application.

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Review of Geopolymer Materials for Thermal Insulating Applications

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Keyword: Geopolymer, Fly Ash, Kaolin, Metakaolin, Thermal Insulation.

Abstract. Geopolymer is an environmentally cementitious binder that does not require the existence of ordinary Portland cement (OPC). Geopolymer has many good advantages, including high early strength, low shrinkage, good thermal resistance and good chemical resistance. Based on previous research, geopolymer offered good resistance to corrosion, abrasion and heat. Fly ash, metakaolin, kaolin, and slag are commonly used raw materials for the preparation of geopolymer composites. Geopolymer composites also offer a potential environmental friendly product by curbing the carbon dioxide (CO₂) emissions. This geopolymer material also offers an innovative and sustainable solution for maintaining infrastructure and also provides superior thermal, chemical and mechanical performance. This paper summarizes some research outcomes on alkali-activated binders along with the potential of geopolymer composites for thermal insulating applications.

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A Review – Manufacturing on Rubberized Concrete Filled Recycled Tire Rubber

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Keyword: concrete, rubber, recycle.

Abstract. This paper aims to investigate the potential use of recycled tire rubber in concrete. In Malaysia, rubber consumption of tires in January – June 2014, rose up to 8.4% from 0.388 million tonnes. These numbers keep on increasing year-over-year with the numbers of vehicles, as do the future problems relating to waste tires. Over the past few years, a number of researchers have studied on incorporated the waste tires into cement based materials. In an attempt to reduce the magnitude of this issue, recycled tire rubber has gained interest in concrete improvement. The used of recycled tire rubber in the reinforcement in concrete is considered as value added materials for sustainable development by reusing waste materials. It is believed that using waste tire rubber in concrete could be an alternative way to replace fine and coarse aggregate (sand and gravel) in improving the properties of concrete. Rubberized concretes can be used in architectural applications such as nailing concrete, in road constructions where high strength is not necessary, in wall panels that require low unit weight, in construction elements and Jersey barriers that are subject to impact, in sound barriers as sound absorbers, and in railroads to fix the rails to the ground.

A Review on Processing and Properties of Bottom Ash Based Geopolymer Materials

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Keyword: Geopolymer, bottom ash, alkali-activation, compressive strength.

Abstract. Geopolymerization are chemical reaction between raw material and alkaline activator, where a rapid change of some partial amorphous, specific structure into a compact cemented framework. It was treated with an alkali silicate solution at 45 – 80 °C whereas it's formed from reaction of mineral clays or aluminosilicate-bearing industrial waste. The previous study about geopolymer has been done for many years due to the physical and chemical properties which is suitable to use in the construction industry. A Geopolymer material that was contained most Silica (Si) and Aluminium (Al) is such as fly ash, bottom ash, metakaolin and ground granulate blast slag (GGBS). Bottom ash is produced from coal fired thermal power plant and has a physical characteristic similar as sand or gravel, sand that makes it ideal for industrial application like a green concrete. The different performance of geopolymer is according to the different content of silica, alumina and calcium. To obtain the best geopolymer material, parameter of raw material content, the types and the ratio of alkaline activators also the curing method will affect the high result of compressive strength. This paper will summarize a previous researcher's work about the alkali-activated binder of geopolymer raw materials to become green product.

Review on the Application of Natural Fiber Composite via Filament Winding Using Different Resin

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Keyword: Natural fiber, natural fiber composite, filament winding technique.

Abstract. Even though synthetic fiber gives higher of strength in composites and is a low cost material, the biggest problems faced when using this material is that it does not degrade or compose in the environment. The usage of natural fibers in industrial application becomes the main concern because it offers both cost savings and a reduction in density when compared to existing fibers such as glass fibers and etc. This make the needs for renewable fiber reinforced composites are increasing and have never been as prevalent as it currently is. Although the strength of natural fibers is not great as glass, the specific properties are comparable. Continuous yarn fibers are required to increase the strength for engineering applications and filament winding is a method to produce aligned technical composites which have high fiber content. This paper presents a review on composites made of natural fiber and different resin that's been processed via filament winding technique.



SECTION 3

MATERIALS APPLICATION

Researches on Structural Factor Involvement in Oral Tribology

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Keywords: ceramic materials, tribology, diffractometry, dental medicine.

Abstract. This study is focused on two ceramic materials, D.SING (Ivoclar) and VM13 (emphasis the VITA TN), frequently used in restorative dentistry practice and it comes to complete a full set of results obtained by the authors over several years of research on oral tribology with main influence on oral health. In this way there are involved more specific structural aspects of dental restorative ceramic materials quality as is shown in.

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Electromagnetic Sensors for Improvement of Damage Detection in Composite Materials Reinforced with Carbon Woven Fibers

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Keywords: composite materials, damages, nondestructive testing, electromagnetic sensors, FDTD.

Abstract: This paper presents two methods for electromagnetic nondestructive evaluation (eNDE) of composite materials reinforced with carbon woven fibers using a sensor with orthogonal coils and a sensor with metamaterials lens. The samples were impacted with low energy in order to study delamination influence. The electromagnetic behavior of composite was simulated by finite-difference time-domain (FDTD) software, showing a very good concordance with eNDE tests.

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Elements of Modeling and Simulation for Piezoelectric Motors

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Keywords: characteristics, finite element, analysis, piezoelectric, ultrasonic motor.

Abstract. In order to obtain a high rotational speed in comparison with the known embodiments, due to the increased amplitude of the contact point between the rotor and the active element, due to the possibility of adjusting the speed by changing the frequency of the two signals applied to the coupled discs, or due to the phase shift between the signals if the discs are supplied at the same frequency, it was achieved a stator by a non-removable coupling of two active elements. Modelling was performed in Comsol Multiphysics. In this respect we studied the variation of the strains and of the electrical potential, taking into account the changing of the parameters like the power voltage frequency, the power voltage amplitude, the distance between the support point and the edge of the discs system.

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Quality Comparison of Analog and Digital X-Ray Equipment and Materials in a Dental Clinic

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Keywords: Medical materials, x-ray images, x-ray, x-ray in health, digital x-ray, analogic x-ray.

Abstract: Many dental clinics are swapping analog x-ray equipment for digital systems to obtain medical images in the search for improvements such as reduced costs and better care of the images and fast response. However it is necessary to analyze if the digital images have quality requirements in order to provide the diagnosis in a similar or superior way to the analog films. The objective of this paper is to analyze the quality of the digitized x-ray diagnostic images in relation to the structures represented. The research was conducted in a dental clinic that was changing the analog x-ray equipment for one digital. The results by means of statistical analysis demonstrated that the digital system has better spatial resolution and better contrast. As a suggestion of future research an analysis by dentists to see if on the day of the clinic, these theoretical advantages are confirmed in better diagnostics.

Study Concerning the Thermal Insulation Panels with Double-side Anti-condensation Foil on the Exterior and Polyurethane Foam or Polyisocyanurate on the Interior

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Keywords: energy efficiency, energy performance, building envelope, thermal rehabilitation scenarios, polyurethane foam, double side anti-condensation, polyisocyanurate.

Abstract. The paper aims to assess the energy performance of a thermal rehabilitated ground floor building by using new thermal insulation panels with double-side anti-condensation foil on the exterior and polyurethane foam or polyisocyanurate on the interior (PUR or PIR) in various ways. The study also wants to emphasize the benefits of using these insulating materials encouraging their further use. Therefore, five scenarios are carried out, four thermal rehabilitation scenarios and the reference building scenario, without thermal insulation. The obtained results are evaluated by comparison. The results point out the energy performance of PUR and PIR used as thermal insulation panels for the building envelope but also the economic impact and the economic efficiency that involves using such panels. This work is based on the energy efficiency requirements targeting the building envelope and takes into account mainly the behavior of the envelope elements while the heating system is treated in a simplified manner, considering its usual efficiency. The conclusions highlight the main advantages of using these panels for buildings thermal rehabilitation compared to other common materials, such as polystyrene or mineral wool.

The Rationalization of Production of Ring-Shaped Drop Forgings using Computer Simulation of Closed-Die Forging Process

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Keywords: closed-die forging, flash, ring-shaped drop forging, computer simulation, material flow.

Abstract. The rationalization of ring-shaped drop forgings production may be considered from different points of view. Important aspects of evaluation and selection of optimal production alternative are material and energy savings and issue of forging tool life. This contribution describes advanced technology of closed die forging without flash, which represents an effective method of manufacture of ring-shaped drop forging from steel alloy type 16MnCr5. This proposed method offers a cheaper possibility of production of mentioned forging piece resulting from saving of batch material. At present drop forgings with this shape are produced by an uneffective method, i.e. die forging with flash, which brings a considerable material loss. Simulation software determined for simulation of bulk forming processes have an important position at development of new advanced technologies of drop forgings production. A simulation program MSC.SuperForge described in this contribution was used in order to verify correct plastic flow of material in closed die cavity.

Strengthening of Masonry Walls using Fiber Reinforced Polymer (FRP) Materials

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Keywords: Masonry walls, ceramic blocks with hollows, strengthening, FRP materials.

Abstract. The paper presents the behavior of masonry walls built up using ceramic blocks with hollows tested in bear state and then strengthened using FRP materials. A number of two masonry walls are subjected to cyclic in-plane horizontal loads and constant vertical loads, in order to determine the efficiency of the strengthening solutions compared with the shear resistance of the walls in bear state. Also, the experimental program is useful to observe the failure modes of the strengthened walls and also to determine if such strengthening solutions is earthquake-resistant.

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A Holistic Approach to a Sustainable Steel Building

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Keywords: steel houses, sustainable buildings, life cycle, environment impact.

Abstract: Impacts of production, operation and use of a building on the environment and society cannot be ignored in design any more. Instead, performance and impacts of a building needs to be considered for a lifetime, established by design rules 50-100 years. Steel, as constructional material, plays an important role as a component for buildings and engineered structures, with a wide range of applications. Like other industrial activities, steel industry works continuously to improve in terms of sustainability. In fact, it can be observed that in the last decades, the steel frames houses, as an alternative to houses made of traditional materials, offers a lot of advantages in terms of sustainability. The approach in term of a life cycle for a building is an objective process for the evaluation of the impact on the environment, associate to a production process or to an activity. These approaches are recommended by the Integrated Product Policy (COM2003) for the evaluation of the potential impact of the products. In present, there are 2 majors categories instruments for the evaluation of the built environment, on one hand made on qualitative instruments based on criteria and score, and on the other hand instruments that use an quantitative analyze of the inputs and outputs based on a life cycle. Some of these methods are used for the certification of buildings as “green-buildings”. Even many parameters are usually quantitative; they can be also qualitative in the same time, when we try to quantify the advantages due to materials.

Stone Monuments Consolidation with Nanomaterials

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Keywords: chalk stone, hydroxyapatite, nanomaterials, Basarabi monument.

Abstract. Historical monuments suffer different forms of degradation, due to some improper works on architecture structure, vibrations caused by blasting, traffic, the inadequate restoration, the phenomenon of freeze-thaw, air pollution, humidity and temperature variations, friable mortar, deposits adhering impurities (dust, smoke, tar), soluble efflorescence, poorly soluble or insoluble salts (nitrate, sulfate, chloride, carbonate), and the action of microorganisms. Nowadays, the nanomaterials represent an alternative in architecture conservation, mainly due to their improved mechanical properties, their compatibility as consolidating materials, and because they obey the principle of authenticity of historical monuments. In this paper, hydroxyapatite nanoparticles (HAp) are applied to the chalk samples prelevated from Basarabi monument. Some physico-chemical and mechanical properties have been evaluated and discussed for untreated chalk stone and for the treated one with HAp.

Carbon Fiber Strips Retrofitting System for Precast Reinforced Concrete Wall Panel

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Keywords: Retrofit, Experimental Test, TRM, Precast, Reinforced Concrete, Seismic Behavior.

Abstract. This paper presents the retrofitting procedure used on a precast reinforced concrete wall panel (PRCWP) in order to restore its initial load bearing capacity. The specimen used in this experimental test is one from the residential multistoried buildings constructed in Romania from the 1970 onwards. All of the characteristics of the element are from the specific era, only scaled down with a factor of 1:1,2. The element was subjected to in-plane reversed cyclic loading to simulate its seismic behavior and obtain its maximum load bearing capacity. After the test we retrofitted the element using Carbon Fiber Strips Externally Bonded (EBR) and anchored with Carbon Fiber Reinforced Polymers (CFRP) mesh. The porpoise of the paper is to compare the maximum loading bearing capacity of the unstrengthen and strengthen elements in order to compare them and examine the efficiency of this retrofitting procedure..

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Innovative Synergistic Valorization of Lignite Fly Ash and Steel Industry Scrap-soil as Secondary Resources for Compacted Ceramics

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Keywords: lignite fly ash, scrap-soil, ceramics, compaction, sintering, diametral tensile strength, thermal conductivity.

Abstract. In the present research, the combined utilization of fly ash (FA), derived from a lignite-fed power station, along with scrap-soil (SS), a steel industry by-product, is investigated, for the development of eco-friendly ceramics, thus enhancing innovation and sustainability. The valorization of these low price and largely available industrial secondary resources as 100% the raw materials mixture in ceramic industry arises interesting technological, environmental and economical benefits. FA and SS were mixed in various proportions (0-70%wt. in SS), cold compacted at 20 tn load using an automated hydraulic press to form a series of 5 cm diameter disc-shaped specimens, and finally sintered at three different peak temperatures (1000°C, 1100°C and 1140°C) for 3h. Then, the specimen microstructure and physico-mechanical properties were characterized. According to the experimental results, a sintering temperature increase from 1000°C up to 1140°C significantly improves specimen densification, thus sharply enhancing the diametral tensile strength (DTS), from 0.5 MPa up to 12.8 MPa respectively for a 50-50%wt. FA-SS mixture. Mechanical strength also varies with the SS percentage in the raw materials. Physico-mechanical properties seem to be constant for specimens containing SS up to 60% at 1140°C.

Mechanical and Thermal Performance of Straw Bales

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Keywords: straw bale wall, ecological material, mechanical performance, thermal performance.

Abstract. Ecological houses have become very popular lately due to an increasing concern regarding the reduction of the CO₂ emissions generated by the building sector. An ecological house is perceived as a building that enhances the environment rather than degrading it. Straw bale houses are considered to be an ecological and energy efficient solution to the traditional houses. The research aimed to evaluate the use of straw bale in constructions. The experimental work included the mechanical and the hygrothermal behaviour of straw bale, i.e. compression test, moisture content and thermal conductivity determination on a straw bale wall placed in climatic conditions specific for Romania. The research results show a better thermal performance than some of the traditional choices existing on the market. The study provides encouraging insight into considering straw bale solutions as a first alternative to the classical ones.

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Layered Double Hydroxides (LDHs) Type Materials Used in Water Treatment

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Keywords: Layered double hydroxides, adsorption, toxicity, water, human health.

Abstract. Layered double hydroxides (LDHs) or LDHs matrices used for water treatment have been reviewed in this article. These aggregated nanoparticles can be obtained by sol-gel, hydrothermal or coprecipitation method, therefore their shape, size, properties (such as magnetic, acidobasic, red-ox, texture and assembly) and applications are tailored as a function of synthesis method and process parameters respectively. Among other materials used in water treatment we chose layered double hydroxides generally named LDHs or in particular case hydrotalcites (MgAlLDHs). During calcination layered structure is destroyed giving rise to new structures like mixed oxides partially crystallized. LDHs and calcined LDHs type materials were able to uptake selected products. An important issue for removal of undesirable species for human health was M²⁺/M³⁺ cation ratio. Results show a better uptake of anionic compounds for thermally activated LDHs due to their “memory effect”. A large variety of LDHs was investigated in order to demonstrate their adsorption capacity for anionic compounds, cations, gas compounds even microorganisms. Nowadays one of the attractive issues of nanoscience is both the synthesis of these nanostructures and the assembly and organization way but the interest of scientists is to find new properties and applications in order to protect the environment. These cost effective, eco-friendly materials revealed new opportunities for waste water treatment.

The Electrical Resistivity of Geopolymer Paste by using Wenner Four Probe Method

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Keywords: Geopolymer, Fly Ash, Wenner Four Probe, Geopolymer Paste, Electrical Resistivity.

Abstract: This paper presents an experimental study of the electrical resistivity of geopolymer paste by using a non-destructive test employing Wenner four probe method. Geopolymer is produced from a combination mixture of aluminosilicate materials which is rich in Si and Al such as fly ash with an alkaline activator. Geopolymer paste in this study was made from a mixture of class F fly ash, sodium hydroxide (NaOH) solution and sodium silicate (Na₂SiO₃) solution. An alkaline activator was prepared 24 hrs prior to use with the ratio mixture of Na₂SiO₃/NaOH being 2.5. Then, the prepared alkaline activator was mixed with the fly ash for about 30 minutes. After that, the mixture was placed in a 100 mm x 103 mm x 495 mm mould. After 24 hrs, the sample was taken out from the mould and cured at 60°C in the oven for 24 hrs. The sample was then tested after 7, 14 and 28 days. The current applied in this study was from 0.01 mA to 1.00 mA and the electrode spacing used were 0.02 m, 0.04 m, 0.06 m, 0.08 m and 0.10 m. The results showed that the geopolymer paste after 28 days with the current of 0.01 mA and 0.10 m electrode spacing showed the highest resistivity with 61575 Ω.m while the geopolymer paste after 7 days with 0.95 mA and 0.02 m electrode spacing showed the lowest resistivity with 537 Ω.m. Hence, the corrosion rate of geopolymer paste in this study was negligible and if occur, was very low.

Removal of Iron and Total Chromium Contaminations in Landfill Leachate by Using Electrocoagulation Process

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Keywords: Electrocoagulation, initial pH, applied voltages, electrodes, Aluminium, Stainless Steel.

Abstract. This research work involves the study removal of Iron and Total Chromium by electrocoagulation process. This project focused on leachate landfill from Pulau Burung, Nibong Tebal, Penang as an electrolyte solution. These heavy metals are the main factor contributing to pollution in leachate landfill. Types of electrodes used in this study were Aluminium (grade 5052) and Stainless Steel (grade 316). The ranges of initial pH applied were pH (3, 4, 5, 6 and 7) and voltages applied were 1.5V, 2.0V and 2.5V. These three parameters were evaluated and the operation time was 60 minutes. At the end of electrocoagulation process, the solutions were stored and analysed using AAS to determine the final concentration of electrolyte solution.

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Determination Performance of Thermoacoustic Heat Engine Simulation by Delta EC Software

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Keywords: Delta E.C., Thermoacoustic Heat Engine, Hot Heat Exchanger.

Abstract. Thermoacoustic Heat Engine probably the most efficient energy source for electronic devices for the next 10 year ahead that require small amount of electrical energy to operate. This study was to simulate the Thermoacoustic Heat Engine (TAHE) standing wave system by conducting a Fluid Structure Interaction (FSI) by using a Thermoacoustic system's software named DeltaEC for better understanding on the fundamental of TAHE standing wave system. Some characteristics or parameters in the system that were studied in order to derive the fundamental knowledge of TAHE standing wave system. The thickness of Hot Heat Exchangers (Hot HX) plays the major role in affecting the maximum acoustic power generated, the level of onset temperature difference and maximum pressure amplitude followed by the stack length. Hot HX dimension (thickness) contributes nearly 3.3% changes in maximum acoustic power where the lowest thickness scores the highest maximum acoustic power generated. 2.9% of increment on maximum acoustic power generated by altering the length of the stack by 5 mm.

Design a High Port Isolation MIMO Antenna for 2-6 GHz Bands AP Applications

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Keywords: wide-band antennas, MIMO antenna, Polarization, Port isolation.

Abstract. A novel wide-band multiple-input multiple-output (MIMO) antenna system with high port isolation is proposed. The antenna system consists of three equally spaced antennas mounted on a hollowed triangle ground. The antenna system was designed to operate at frequency bands between 2 and 6 GHz. Each antenna mainly comprises of a shorted, inverted wide L (shorted iWL, a unique feeding design), sitting on a vertical ground attached to the horizontal plane of triangular shape. From simulation and experimental results, the proposed MIMO system exhibited superbly characteristics at 2.4, 3.5 and 5 GHz bands, with significant isolation performance due to the design of the practical and novel ground structure.

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A Pipeline Inspection Robot with a linear electric drive pusher to drive Linkage Clutch Mechanism

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Keywords: pipeline inspection, robot, congregate protruding gearwheel, mechanical clutch, wheel chain.

Abstract. This paper presents a pipeline inspection robot with a linkage mechanical clutch, which is added a novel congregate protruding gearwheel kinematic model that can be used for conquest irregular environmental barriers. This robot has three powered wheel chains each of which has a mechanical clutch and a congregate protruding gearwheel kinematic model. The mechanical clutch is used a parallel linkage type mechanism. The robot is designed foldable when each chain contacts the ground or wall of pipeline. Thus, the robot can be operated in various sizes of pipeline, and can utilize the congregate protruding gearwheel kinematic model to conquer the irregular barriers of pipeline. The proto type of the robot system has been developed, and experiments are carried out to verify the validity of the proposed design.

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Design a Low-Profile, Printed UWB MIMO Antenna with a 5.8 GHz Band Notch

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Keywords: MIMO antennas, UWB antenna, band-notched, isolation.

Abstract. A compact printed UWB MIMO antenna with a 5.8 GHz band-notch is presented. The two antennas are located on the two opposite sides of a Printed-Circuits-Board (PCB), separated by a spacing of 13.2 mm and a small isolated element, which provides a good isolation. The antenna structure adopts coupled and parasitic modes to form multi-modal resonance that results in the desired ultra-wideband operation. There is a parasitic slit embedded on the main radiator and an isolated element employed between the two antennas. An excellent desired band-notched UWB characteristic was obtained by careful design of the parasitic slit. The overall size of the proposed antenna is merely 40.2 × 54 × 0.8 mm; the radiation patterns of the two antennas cover the complementary space of 180°; the antenna yields peak gains varied from 5 to 8 dBi, and antenna radiation efficiency exceeding about 70–90 % over the operation band. The antenna port Envelope Correlation Coefficient (ECC) was less than about 0.07. Moreover, the antenna is easy to fabricate and suitable for any wireless modules applications at the UWB band.

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Integrating of TRIZ 40 Inventive Principles and Evolution Trends for Product Innovation

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Keywords: Systematized innovation, 40 inventive principles, trends of evolution.

Abstract. In an increasingly competitive global market, a company's ability to continually introduce innovative products has become even more crucial. However, most companies still employ traditional brainstorming methods to develop ideas for innovation but cannot guarantee that the resulting solution can cover all necessary angles. Therefore, this study develops a systematized process to explore product innovation potential and establishes a specific innovative solution that enables innovations to be investigated and employed by everyone. For this study, we integrated Altshuller's 40 inventive principles and Mann's 31 trends of evolution to establish six dimensions of product innovation: the market, function, structure, resources, operations, and appearance. After deeply analyzing each of the inventive principles and trends of evolution for similarities and differences, we summarized these principles and trends into various dimensions, which we then used to create the structure and procedures for systematic product innovation. By employing these procedures and the corresponding inventive principles and trends of evolution, users can consider product innovation comprehensively. In this study, we further verify the practicality and efficiency of this method using examples..

The Facing Challenges and the Responsive Strategies of Apple App Store

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Keywords: App Store, mobile device, industry business model, SWOT analysis.

Abstract. With time passing and technology advancing, daily necessities grow ever more creative and diversified, particularly electronic items. Apple, Inc. pioneered in App stores to set the stage for myriad business opportunities, as evidenced by firms who follow our lead. The authors use Porter five forces and SWOT analyses to evaluate challenges facing Apple Application Stores. Finding the advantages of Apple application platform mainly came from many loyal customers. Faced with such application of platform use, other companies use open operating systems and launch diverse styles of devices to compete with Apple's closed operation system and fewer styles. To maintain our competitive edge, study suggests Apple should increase affinity interface, raise proportion of free applications, launch cheap mobile devices, adopt flexible profit-sharing with software developers, and offer consumers more choices.

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Review of Soil Stabilization Techniques: Geopolymerization Method one of the New Technique

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Keywords: Geopolymerization; Soil; Soil stabilizer; Soil stabilization; Unconfined Compressive Strength (UCS).

Abstract. This paper studies the effectiveness of soil stabilizer on the problematic soil or soft soil. It is subjected to instability and massive primary and long term consolidation settlements when subjected to even moderate load increases. The purpose of this study is to review the techniques and materials that have been used in the soil stabilization by previous researchers. The performance of the soil stabilizer for stabilization by means of strength has been highlighted in this study. Unconfined compressive strength (UCS) test was carried out on stabilized soil samples and the results that obtained were discussed. The use of these techniques and materials may provide an inexpensive and advantageous construction process. As a conclusion, the strength of soil can be increased by using these materials and techniques in soil stabilization. This paper gives a comprehensive report on stabilization techniques and materials that have been used for soft soil and also discuss the potential of geopolymerization technology to be one of the new soil stabilization techniques.



SECTION 4

MATERIALS & LIFE SCIENCE

Respiratory Parameters-Based Approach to Assessing Dust Loading

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Keywords: Individual sampler, dust, impedance pneumography, cardio - respiratory parameters.

Abstract. The idea of assessing the respiratory organs' protection means has been considered, that takes into account the dust penetration coefficient and dynamics of the worker's cardio respiratory parameters under working conditions. The individual samplers' speed is proposed to be controlled by means of the lung ventilation while dust loading inside and outside the individual protection means is to be determined. This enables assessing them by a conventional performance factor taking into account cardio respiratory parameters as well.

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Physico-Chemical Parameters in Mountain Freshwater: Cuejdi River from Eastern Carpathians, Romania

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Keywords: physico-chemical parameters, freshwater, anthropic pressure, Cuejdi River, Eastern Carpathians.

Abstract. Spatial and seasonal variation of physico-chemical parameters of mountain streams is influenced by anthropogenic pollution pressure. The assessment of Cuejdi river water quality from Stânișoarei Mountains through 13 parameters, was performed. 30 samples each were collected during spring and autumn of 2013/2014, measurements being made both in situ aquatic ecosystem (Multi 350i / SET WTW) and in laboratory (bench meter Hanna HI 4421, Titroline 700 SI Analytics and WTW Turb 555IR).

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The Biomaterial Relevance of Oxytocin in Some Zebrafish Studies

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Keywords: Oxytocin, neuropsychiatric disorders, animal models, zebrafish.

Abstract. Oxytocin is a nonapeptide hormone that is involved, besides its classical functions, in linking social signals with cognition, behaviors and reward. Also, it seems to have a critical role in the regulation of brain-mediated processes that are strongly relevant to many neuropsychiatric disorders. In this way, in the present paper we will try to describe the most important and modern aspects regarding the relevance of oxytocin administration in various animal models of neuropsychiatric disorders, as well as in human patients. Also, the relevance of zebrafish studies in this context will be extensively discussed.

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The Recycling of Materials - From Green Marketing Strategy to the Need for Sustainable Development in Contemporary Society

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Keywords: Sustainable Development, greenmarketing, environmental legislation, recycling, waste managing.

Abstract. Sustainable development becomes a desiderate increasingly important, both for policy makers and for manufacturing companies. Behind this concept, however, there are a number of factors and strategies covering topics from the education of population from an ecological point of view and legislative stipulations designed to influence the management of all resources. In this context, strategies arising from the private greenmarketing are completing the coercive force of European legislation.

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The Effect of Storage Time on the Composition of the Olive and Sunflower Oils

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Keywords: olive oil, sunflower oil, iodine value, anisidine value.

Abstract. The effect of storage time on the composition of the olive and sunflower oils has been investigated. It were studied parameters like free fatty acids (FFA), anisidine value (AV), iodine value (IV), saponification number (SN) and identification of the molecular structure through FT-IR method. During storage (48 months) an increasing in the values of parameters FFA and AV took place that measures the oxidative degradation of oils. The oxidative stability of olive oil stored at room temperature was less than of sunflower oil. Also, significant differences were found among the olive oil and sunflower oil during storage period.

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Structural Health Monitoring System, Development and Testing

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Keywords: Structural health monitoring, masonry, internet of things, out of plane, seismic.

Abstract. The work presents a system intended for continuous monitoring of structural parameters for any type of structure to provide a better understanding of structural and material behavior. The system is in the final stages of development and its purpose is to gather data via a bus connected to several displacement, temperature, noise, gas detection and vibration sensors. The system is designed to be modular, meaning that two more systems can work as one. The data gathered is sent to a web server from where it can be accessed and interpreted. The main advantage of the system is the accessibility, which takes into account the financial factor, size, power consumption and resistance to unfavorable conditions. The implementation of this kind of system can result in prolonged life span of the monitored structure. The use is not designed solely for long term use, it can also aid as a data acquisition device in experimental testing programs such as experimental retrofitting strategies. In this paper certain functions of the system are used to test the out of plane behavior of a nonstructural masonry infill wall. The main focus is to test the accuracy of the RLPTs under low voltage conditions and also test the software time based scheduled recording function accuracy and detect the occurrence of bugs or data loss..

Characteristics Evolution of Transylvanian Sand after Biogrout Treatment

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Keywords: Microbially Induced Carbonate Precipitation (MICP); Biogrout; Sporosarcina Pasteurii.

Abstract. This paper presents the evolution of Transylvanian sand characteristics after calcium based Biogrout treatment. By injection into the sand body of microbiological entities and certain chemicals sand is transformed into sand-stone in a short time by a phenomena called Microbially Induced Carbonate Precipitation – MICP. Triaxial testing was performed on treated samples in a confined-drained system and geotechnical and mechanical parameters were calculated. The results obtained were then compared with data from triaxial tests on the same untreated sand in the same conditions. It has been found that sand parameters suffer significant changes after Biogrout treatments in only a short period of time.

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Ballasted Track versus Ballastless Track

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Keywords: Rail superstructure, rail supports, concrete sleeper, ballasted track, slab track, stability, maintenance.

Abstract. First concrete sleepers were made of normal reinforced concrete and used during the 1930s and 1940s. Concrete railroad ties became popular in Europe after World War II because of the advances in design, material quality and production of pre-stressed concrete. Now as before, concrete sleepers on ballast represent the primary basis of track construction, around the world, but the twin block concrete sleepers are also popular and widely used. The continuously increasing operational loads and speeds forced the railway companies to update their technical and economic system to keep their vital role in transporting passengers and merchandise. In this development a very important role played the superstructure of the railroad system, and this modernization process led to appearing of the ballastless track system approximately 60 years ago. The article presents a comparison of two main types of track systems, including technical and economic aspects.

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Impact on Surface Treatment of Hydrophobic Consolidation Terracotta Ornaments

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Keywords: geomaterials, old terracotta, pellicle solutions, waterproofing, chromatic reintegration, colorimetry, optical microscopy, humidity measurements.

Abstract: During the consolidation and rehabilitation interventions of George Radu Melidon City Library Roman, Neamț County, a series of architectural terracotta decorations, manufactured in the second half of the century XIX, have been identified and cataloged. The current state of these decorations, made from geomaterials, requires the establishment of a technical solution which will be used to preserve, to strengthen the color, the aesthetic surface and the chromatic reintegration. Thus, the paper presents the study of four current commercial chemicals products, part of the additives hydrophobic/waterproofing group. One of the products is a water based emulsion, while the other three are organic based solvents. This study was required in order to develop an optimal treatment to preserve the old terracotta from facade of building already mentioned. The technical features that these products have in common are sealing and waterproofing by superficial coating, with an average penetration and restoration of chromatic aspect, as close to the original. CIE L*a*b* colorimetry, optical microscopy and the measure of humidity (reversible water content and related chemical) were implemented in the study of optimization of pellicle dispersion systems based on the four chemicals.

Study of an Old Coin Set Using Nondestructive Techniques

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Keywords: silver coins, corrosion products, MO, SEM-EDX, micro-FTIR.

Abstract. The paper presents the chemical composition and mineralogical distribution of the corrosion crust, more so the chemical composition and the texture of the metallic core on three silver coins dating from the seventeenth century, discovered in various tombs in the necropolis belonging to the former Stratenia Church from Iasi. These were examined by the corroboration of optical microscopy, electron microscopy coupled with X-ray diffraction (SEM-EDX) and the micro-FTIR techniques. The data allowed to establish the main alloy and of the evolutionary contexts during the laying period, based on the texture of the metallic core and on the layout of corrosion products.

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The Study of Ornamental Gildings in Old Tempera Icons, from the XVIII-th Century

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Keywords: egg tempera icons, gilding, materials, conservation state, Optical Microscopy, SEM-EDX.

Abstract. The paper presents the study of old ornamentation techniques used into making of two icons from the XVIII-th century, part of the heritage of Tazlau monastery, Neamt County. In order to do this, the materials used to create the polychrome layers and their current conservation state was analyzed. The data obtained by investigating the two mentioned elements have allowed for the identification of different traditional techniques, used for ornamental gilding. Optical microscopy (OM) and Scanning Electron Microscope coupled with Energy Dispersive X-ray spectroscopy (SEM-EDX) were employed in the analyses. The archaeometrical characteristics of the pigments and binders, collaborated with the aesthetic analyses, allowed the dating of the two icons for the end of the XVIII-th century.

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The Effects of Incenses' Smoke on Different Types of Varnishes

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Keywords: frankincense, myrrh, microscopy, varnish.

Abstract: different types of incenses are burnt during religious ceremonies in churches: frankincense, myrrh or rosin based incense. The icons from iconostasis usually are not protected by glass and they are exposed to the burning products of incense. To study the influence of burnt frankincense, myrrh and rosin based incense artificial on different types of dammar varnishes, samples of balsa wood covered with gesso, titanium white and dammar varnish were exposed to incense and were artificial aged under UV-A light for 60 hours. This paper presents the colour changes suffered by the varnishes..

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Design Practitioner Perception in Determining the Terminology of Biomimicry, Anthropomorphised and Semantic (BAS) in Design Application

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Keywords: Perception, understanding, terminology.

Abstract. This paper focuses on the perception of the design practitioner about the terminology design of Biomimicry, Anthropomorphism and Semantic (BAS). This paper also shows the level of understanding design practitioner in evaluating and reviewing the terminology in design. In the world of design, the various elements incorporated into each design to meet the demand and give effect in developing products. For creative designer, ideas, creativity and in-depth knowledge of design can help them in producing designs and elements needed. As a designer, they have own perception in the interpretation of a design. This paper also discusses the level of understanding of the design practitioners in evaluating and reviewing the terms of design. The analysis results also clearly show the level of understanding of the design practitioner in identifying terms BAS.

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Unconscious Interaction between Human Cognition and Behavior in Everyday Product: A Study of Product Form Entities through Freehand Sketching Using Design Syntactic Analysis

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Keywords: Design syntactic analysis, interaction in design, methodology, product design, unconscious interaction and cognition in human behavior.

Abstract. This paper focuses on analyzing form elements and entities implemented by designers using design syntactic analysis. In this paper, selected conceptual sketches generated from an understanding of the theory of unconscious interaction and cognition in human behavior (UICHB) will be analyzed. The ultimate goal is to identify which elements visualized (1) the superior gestalt consisting of form entities and form elements of the highest hierarchical (global) level of the product form; (2) the characteristic shapes which indicates the purpose and function of form aesthetics and (3) a signifying curve as a form ingredient which indicates the functional component of product form. The final section will discuss the result and the significance derived from the outcomes of the study. This includes the functional identifications and analysis of form aesthetics, the consistencies and uncertainty elements, and product concept reasoning.

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Lao-Yiou Tea Extract Inhibits Colorectal Carcinoma Cell Growth

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Keywords: Lao-Yiou tea; colorectal carcinoma; polyphenols; cell growth.

Abstract. Lao-Yiou tea is a traditional medical tea of Hakka people in Taiwan. Here, we test different extraction methods to obtain Lao-Yiou tea extracts and their anti-colorectal carcinoma activity. The results revealed that acetate/acetone immerse and then ethylacetate extraction could obtain an extract contained the most abundant polyphenols and exhibited the highest inhibition activity toward colorectal carcinoma HT-29 cell growth. The results indicate Lao-Yiou tea possesses anti-colorectal carcinoma agents and may provide as a novel colorectal carcinoma prevention agent.

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A Buoy-Type Design to Stimulate Fish Attacks on The Lure

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Keywords: TRIZ, active lure, buoy-type lure, sinking/autonomous sinking lure.

Abstract: As incomes rise in Taiwan, leisure activities are receiving greater emphasis from Taiwanese. Fishing, long a traditional sport, has become more popular in recent years. To attract fish, fishermen frequently use lures, which offer both high catch rates and environmental friendliness. Fishermen who use lures must constantly reel the fishing line in and out to make the lure move back and forth, stimulate fish attacks on the lure, and increase catch rates. This study uses the Theory of Inventive Problem Solving (TRIZ) to conduct a trend analysis of fishing lure improvement and constructs a technical contradiction matrix, it produces a buoy-typedesign. Since the lure can move by itself, fishermen do not need to constantly move the line, improving fishing performance.

Designing Smart City to Developing Country for the Future Life Case Study: Indonesia

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Keywords: Smart City, Developing Country, Indonesia.

Abstract. Smart cities will optimize the use of technology in the design and operation of infrastructure and buildings in a way which meets the current and future needs of their citizens. Truly smart cities should be about more than just harnessing technology. They require consideration of governance and growth, urban development and infrastructure, the environment and natural resources, society and community. Given this situation and the belief by some that the planning, design and construction of future cities requires and integrated approach to achieve successful outcomes in Developing Country like Indonesia, alternative terminology has been suggested. The term “The Living city” refers to an approach in which technology plays an important but nevertheless supporting role. The Government Policy is needed to support the design for reduce all cost in Developing Country that paid by national budget.

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