"Dunărea de Jos" University of Galați
Faculty of Engineering
Department of Material Science and Engineering

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BOOK of ABSTRACTS

UgalMat 2018

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Centre of Nanostructures and Functional Materials (CNMF)
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Cast Iron – State of the Art and Forecast, Contributions

Leandru-Gheorghe BUJOREANU, Faculty of Materials Science and Engineering, "Gheorghe Asachi" Technical University of Iaşi, Romania
Development of a new constrained recovery application of FeMnSi-base shape memory alloys

Viorica Mușat[1], Elvira Fortunato[2], Laurentiu Frangu[3], Nicolae Tigau[4], Rodrigo Martins[2]
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From ZnO-based 1D and 2D nanostructured materials to devices

Ştrul MOISA, Ben-Gurion University of the Negev, Beer-Sheva, Israel
From the Bible (as book) to the Nano-Bible (as chip)

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POSTER SESSION

INVITED PLENARY LECTURES

I.P.L.1 Cast Iron – State of the Art and Forecast, Contributions

Iulian Riposan

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Abstract: Cast iron is more than 70% of the total world metal casting production [more than 74 millions tons castings each year], with a great development potential. This material is especially attractive to the automotive industry, because of its excellent properties such as castability, machinability, heat conductivity and vibration damping capacity, at low cost production. Thin walls irons castings [less than 5mm wall thickness] are more and more attractive in this field. Ductile iron is also the material of choice for many of the world major wind turbine manufacturers. The need to ensure optimum, consistent and safe performance of these units makes it imperative that only ductile iron castings of the highest integrity and in complete compliance with the specification can be accepted, especially as requirements for high impact properties in ductile iron at low temperatures. Industrial cast iron is a multi-element [more than 30 elements usually presence] eutectic alloy. The crystallization conditions are significantly different from that of equilibrium phase diagram measured at very slow cooling rate, using very pure materials, under vacuum melting, etc. Nonequilibrium solidification conditions, typically for iron castings in foundry industry, favour stable to metastable system crystallization transition, austenitic dendrites formation also in eutectichypereutectic chemical composition ranges, elements segregation, different eutectic solidification undercooling [up to 500C or more], etc. The representative international conference and symposium systems [World / European / American] are reviewed to underline the research and development activities in the cast iron field. A review of Si-alloyed ductile cast iron data shows that the instability of a mixed ferrite-pearlite matrix could be replaced with more predictable and controllable ferritic grades [3.0 to 4.3%Si], while supplementary Mo additions favour superior mechanical properties and improved resistance to oxidation and corrosion at high temperatures. For most applications, alloying with 0.4 to 1.0%Mo provides adequate elevated-temperature strength and creep resistance, while higher molybdenum additions [1.0 to 2.5%Mo] are necessary when maximum elevated-temperature strength is needed. The solidification pattern and structure characteristics of three ductile iron compositions [I-2.5%Si; II-4%Si and III-4%Si - 1.6%Mo] were studied, for higher molybdenum content and low level of Si : Mo ratio, respectively.

I.P.L. 2 Development of a new constrained recovery application of FeMnSi-base shape memory alloys

Leandru Gheorghe Bujoreanu

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Abstract: A new application of Fe-Mn-Si based shape memory alloys (SMAs) was developed under the form of truncated cone-shaped module, for self-adaptive axial preload control in angular contact bearings. The modules were processed by high-speed high-pressure torsion (HS-HPT), from circular crowns cut from axially drilled ingots of Fe-28Mn-6Si-9Cr (mass%) SMA. The specimens were mechanically tested in the hot rolled state, prior to HS-HPT processing, demonstrating free-recovery shape memory effect (SME) and high values for ultimate tensile stress and strain as well as low cycle fatigue life. The HS-HPT modules were subjected to static loading–unloading compression, without/with lubrication at specimen-tool interface, both individually and in different coupling modes. Dry compression cycles revealed reproducible stress plateaus both during loading and unloading stages, being associated with hardness gradient, along cone generator, caused by HSHPT processing. Constrained recovery tests, performed using compressed modules, emphasized the continuous generation of stress during heating, by one way SME, at a rate of ~9.3 kPa/%. Dynamic compression tests demonstrated the capability of modules to develop closed stress–strain loops after 50 000 cycles, without visible signs of fatigue. HS-HPT caused the fragmentation of crystalline grains, while compression cycles enabled the formation of ε hexagonal close-packed stress-induced martensite (ε), which is characterized by a high density of stacking faults. Using an experimental setup, specifically designed and manufactured for this purpose, both feasibility and functionality tests were performed using HS-HPT modules. The feasibility tests proved the existence of a general tendency of both axial force and friction torque to increase in time, favoured by the increase of initial preloading force and the augmentation of rotation speed. Functionality tests, performed on two pairs of HS-HPT modules fastened in base-to-base coupling mode, demonstrated the capacity of modules to accommodate high preloads while maintaining both axial force and friction torque at constant values in time. These preliminary results suggest that, for the time being, the modules can operate only as single use applications, more effective during the running-in period. This bevahior recommends HS-HPT modules as a new application of Fe-Mn-Si SMAs, with the potential to be used for the development of new temperature-responsive compression displacement systems. Keywords: shape memory alloy, high-speed high-pressure torsion, martensitic transformation, functional testing, constrained recovery, thermomechanical training, self-adjustable axial preloading

I.P.L. 3 From ZnO-based 1D and 2D nanostructured materials to devices

Viorica MUŞAT[1]

Laurentiu FRANGU[2], Nicolae ŢIGĂU[1], Rodrigo Martins[3], Elvira FORTUNATO[3]
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Abstract: 1D and 2D semiconductive metal oxide nanostructures stand out by high crystallinity single crystal structure, high electrical carrier mobility compared with bulk or even thin-film materials and the possibility to manipulate band gap energy and control the properties by adjusting their morphology (shape and size), all these properties leading to a broad range of high-technological applications (field effect transistor, UV detector, gas sensors, light emitting diodes, solar cells, electrical batteries, low powered electrical devices).

The paper discusses some functional properties that enable 1D and 2D nanostructured ZnO-based layers grown by hydrothermal method on glass or silicon substrates to be used in electronic, optoelectronic and sensor applications. The paper shows the functional characterization of ZnO and Al:ZnO 1D nanostructures grown in preselected areas for direct integration into gas sensors, UV photodetection devices, photovoltaic cells. Potential applications of 2D nanostructured Al:ZnO layers as voltage rectifier or signal detector for circuits powered from low voltage sources or as voltage surge protection device is presented.

Keywords: 1D and 2D nanostructures, (Al):ZnO, solution-based synthesis, morphology and crystallinity, optical properties, electrical properties, gas sensing, photodetection device, photovoltaic cells, voltage rectifier/signal detector for low powered circuits, voltage surge protection device

I.P.L. 4 From Bible (as book) to Nano-Bible (as chip)

Strul Moisa

Ben-Gurion University of the Negev, Beer-Sheva, Israel

Abstract: The World's smallest Bible, the Nano-Bible, is engraved on a Nano-gold stratum and a silicon substrate chip (5mm x 5mm) - smaller than a pinhead - and readable with an electron microscope. This outstanding achievement was made possible by using one of the many advantages offered by nanotechnology: a focused ion beam (FIB) generator of gallium ions. This presentation will follow the Bible`s "adventure" - starting with manuscripts from Qumran / Dead Sea, through the Gutenberg Bible (the first major book printed using mass-produced movable metal type in Europe) and the mini-bibles as intermediary "stations" - to the current "station": the NanoBible.

Keywords: Bible, Nano-Bible, nanotechnology, FIB generator, gallium ions.

ORAL PRESENTATIONS IN CONCURRENT SECTIONS

Section I: ADVANCED MATERIALS AND TECHNOLOGIES (TMA 2018)

O.P.1 Impactul industriei asupra dezvoltarii durabile

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Abstract: Since always, nature was seen as a never-ending source of resources and an ideal place for waste disposal. Natural resources have become the main focus of security resource and the engine of economic development. The man and similarly, the resources he uses to survive, are components of the environment. Hence wise, the activities carried out by men should be integrated into the environment, without affecting it. In this article we want to underline the importance of the environment on economic's developmentThis paper is based on the KNOW HOW principle and it shows the influences of the impact on products cost price.
Keywords:"know how", environment, resources, security, economic development.

O.P. 2 Corrosion resistance of 304L stainless steel for orthodontic fixed appliances in saliva and different pH solutions from food or drinks

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Abstract: In addition to many industrial applications and food industry, 304L stainless steel is also used in some implants (tooth straightening system, screws, ceramic teeth resistance structure, orthodontic brackets etc.). Even if 304L stainless steel is a materials with high corrosion resistance, however, it can be corroded in the oral cavity or human body while under conditions of low pH, the presence of dental plaque, and a high chloride ion concentration. The pH of the biological environment in which orthodontic systems are used has a significant effect on the rate of corrosion. When the orthodontic systems are combined with a ligature wire or an elastomeric O-ring, crevice and galvanic corrosion can occur in the oral cavity, and further types of corrosion

may develop. Pitting corrosion of orthodontic appliances is common due to the aggressive action of chloride ions in saliva, or from food and drinks.
This study was undertaken to evaluate the accuracy of corrosion resistance of commercially available 304L stainless steel in biological solutions with different composition and pH.
Thus, two solutions simulating human body fluids (SBFs) such as Hank's solution having a pH of 7.25 and Fusayama Mayer saliva having a pH of 4.8 were chosen. The two solutions also have different concentrations of chlorides. The corrosion resistance of the biocompatible alloys used in implants is of particular importance not only because of the increased life of the implanted device but also because the corrosion process has harmful effects on the body. The biological fluid in the human body contains water, salt, dissolved oxygen, bacteria, proteins, and a variety of ions, chlorides and hydroxides, so the human body is therefore a very aggressive environment for metals and in conclusion the products resulting from the corrosion process affect metabolism and cellular behavior
Citric acid was chosen as a test solution being an organic compound very used in the food industry. The citric acid solution has no chlorides and a pH of 1.81.
Keywords: 304L stainless steel, biological solution, corrosion resistance

O.P. 3 Hydrogen peroxide and metabolic albumine. What is the interaction between them? Have sinergetic effect on electrochemical behavior of titanium implant alloy?

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Abstract: A synergistic effect is the result of two or more processes interacting together to produce an effect that is greater than the cumulative effect that those processes produce when acting individually. The concept is an important consideration for health.
It is very important to know how human albumin acts on the titanium implant because it is the most abundant protein in the human body (ca. 50-60% of total plasma protein).
Albumin has multiple important physiological functions including maintenance of colloidal osmotic pressure, binding of a wide variety of compounds and provision of the bulk of plasma antioxidant activity.
The factors regulating albumin distribution are independent of the movement of water across the capillary membrane.
Hydrogen peroxide, the same mild acid that many people use to disinfectant some objects, is also produced by the body to keep cells healthy. So, when the immune system is activated in response to bacteria, large amounts of hydrogen peroxide are produced by certain cells to fight the infection.
An ideal biomaterial is expected to exhibit properties such as a very high biocompatibility, that is no adverse tissue response. Also, it must have a density as low as that of bone, high mechanical strength and fatigue resistance, low elastic modulus and good wear resistance. It is very difficult to combine all these properties in only one material.

Titanium is considered the most biocompatible metal due to its resistance to corrosion of body fluids, osseointegration capacity and high limitation of fatigue.
Titan's ability to resist interactions that occur in the human body is due to the formation of a protective oxide film, a film that naturally forms in the presence of oxygen. The oxide film is highly adherent, insoluble and chemically impermeable, preventing the reactions between metal and the environment. The unique properties of titanium alloys make them ideal for orthopedic implants without adding too much weight to the limbs or joints.
In situ electrochemical measurements as: open circuit potential (OCP), polarization resistance (Rp), potentiodynamic polarization (PD) were performed to monitor the corrosion process. The optical images of the tested samples have been observed before and after corrosion experiments using an optical microscope (Optika) in order to understand the nature of corrosion and the damages produced by this process.
Keywords: Titanium alloy, human albumin, synergetic effect, hydrogen peroxide, implant.

O.P. 4 Corrosion behavior in Black Sea water of welded joints processed on EH36 naval steel after bending deformation with root compression

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Abstract: In this paper we analyze the corrosion behavior of the welded joints of EH36 naval steel by the Metal Active Gas – mechanized welding process (MAG-M), after bending deformation with root compression. The mechanized butt welding were processed with metal-cored wire and rutile flux-cored wire at two welding positions. The welded joints were made in the following welding positions: PA - horizontal and horizontal in the trough and PC - horizontal vertical wall. The following materials were used in this experimental research work: base material (high strength steel sheet EH 36, dimensions 300x150x10mm), filler material (solid wire ER70S-6 according to AWS A5.18, diameter 1, 2 mm) and auxiliary materials (M21 - Corgon 18 gas mixture and flat concave channel ceramic support). The samples were immersed in sea water harvested in the Black Sea and subjected to corrosion tests by electrochemical methods. The results show good behavior of welded joints subjected to bending and exposed to corrosion in seawater. The results of the corrosion tests indicate similar values for the welded joints.
MAG-M welding, high strength naval steel, metal-cored wire, rutile flux - cored wire, electrochemical methods, marine corrosion.

O.P. 5 Corrosion - A major problem in the functioning of the installations: Assessment of copper and brass corrosion resistance in water and chloride content solutions

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Abstract: Corrosion is the process of destroying metals and generally materials under the action of the environment by chemical or electrochemical reactions.
In all cases, corrosion is a surface or interface problem, between a metal and an aggressive environment. The complex corrosion phenomenon has a destructive action, generating undesirable economic consequences: metal and labor losses, appreciable reduction in the lifetime of various metallic constructions, insecurity in the operation of industrial machinery.
Under the current conditions of accelerated growth in the production of material goods, one of the most important issues is the economy of raw and processed materials as well as economy of energy or and labor force.
The present paper aims at comparative evaluation of copper and brass corrosion in water and solutions containing chloride ions.
The corrosion resistance evaluation was carried out by: monitoring the open circuit potential, the corrosion rate, the polarization resistance, and visualization of the samples tested before and after corrosion by optical microscopy.
Corrosion of materials is a very important process to consider when choosing a material that needs to work in a specific environment.
Keywords: copper, brass, corrosion resistance

O.P. 6 The effect of commercial juices on the corrosion resistance of 316L stainless steel used for orthodontic applications

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Abstract: The corrosion of materials used for orthodontic applications, can lead to adverse effects in patients. The corrosion process releases ions into the oral environment; these ions can have potential cytotoxic effects and may cause allergic reactions in patients. At sufficiently high levels of ion release, evident enamel discoloration can occur. It is important to note that the oral environment is very favourable to the formation of corrosion products. The mouth is wet and

continuously subject to temperature fluctuations. Food and drinks cause transient but important variations environmental chemistry. Foods and liquids ingested have at wide pH ranges. The acids are released during the breakdown of food. This rest of food often adheres to metallic toughness restoration providing a localized condition that is extremely favourable to an accelerated reaction between the oral environment and the metal.
The aim of this study is to evaluate the corrosion behaviour of 316L stainless steel in three commercial juices by electrochemical methods, in view of orthodontic applications.
In situ electrochemical measurements as: open circuit potential (OCP), polarization resistance (Rp) and cyclic voltammetry (CV) were performed to monitor the corrosion process. The optical images of the tested samples have been observed before and after corrosion experiments using an optical microscope (Optika XDS-3 MET) in order to understand the nature of corrosion and the damages produced by this process.
Keywords: 316L stainless steel, orthodontic applications, commercial juices, corrosion resistance

O.P. 7 Fatigue analysis of connecting rod in internal combustion engine

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Abstract: The connecting rod along with the crankshaft turn the translation movement of the piston into rotation. The alternating forces to which the connecting rod is subjected led to the occurrence of micro-fissures, causing the breaking at much lower forces than the maximum allowable stress of the material. This work presents the finite element analysis to determine the fatigue strength of the connecting rod. The results of the study show the dependence of fatigue resistance according to the configuration of the connecting rod processing surface for the two types of the analysed steel.

O.P. 8 Selection of various alloys for aerospace applications

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Abstract: In the aerospace industry, metals and alloys have known a great importance, being required a detailed knowledge of the main specific features and limitations in order to identify and use appropriate for the desired applications.
This paper report the main types of metals and/or alloys used as substrates and structures in the aerospace industry, but also in other specific applications. The process of selecting materials (metals or alloys) is relatively complex, because it involves multiple requirements on performance characteristics (tensile strength, impact resistance, fracture toughness, damage tolerance, corrosion resistance, temperature resistance and low weight etc.), but also the long-utility without negative influence on the environment.
The most common types of materials are aluminum alloys (1xxx - 9xxx series), titanium alloys (α, β, α+β structural types), magnesium alloys (AZ, AM, AE, EZ, ZK, WE series), nickel alloys (N 600, 800, 825, 718, 10675, 09777 series) etc., which due to their versatility and reliability become useful for the manufacture of most components and aircraft structures.
The objective of this study consist in validate the metal alloys that can be used as substrates based on the physico-mechanical properties, the compatibility between the components, so that the whole assembly has practical applicability in the selected domain.

O.P. 9 Use of glass fibers for impact protection system. A review

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O.P. 10 Evaluation of tensile characteristics for a class of polymeric blends (PP + PA6)

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Abstract: This paper presents the influence of component concentration of a class of polymeric blends. The blends consist of different concebtration of PP and PA6 and a constant concentration of additives (CaCO3, LDPE and an adhesive)

O.P. 11 Neural network architecture optimization by analyse the mechanical characteristics of civil engineering materials

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Abstract: Our proposal for this work is to diversify the architecture of neural networks in order to optimize it and to obtain the best performing configurations that minimize errors of predictive mechanical properties of polymeric concrete. In this paper different architectures of artificial neural networks will be used for investigating the flexural strength of polymer concrete with fly ash and fibers. In the present study the epoxy resin was used for binding the aggregates. In the composition were introduced near the fly ash, used as filler, the cellulose fibers for improving the properties. The characteristics of these artificial neural networks architectures will be presented and analyzed in order to choose the one that minimizes the prediction errors of the mechanical characteristics of polymer concrete and presents an optimal configuration that allows a high working speed that can adapt to this type of approaching the problem with a strong nonlinear character. By using this modern predictive methods, it was attempted to highlight its basic character - learning by examples specific to the human brain but much more efficient due to the mathematical models of the activation functions and the interconnection between the layers of neurons that exponentially increase their ability to adapt to strong nonlinear phenomena. Thus one can say that such a prediction helps to reduce the number of real experiences and can greatly contribute to obtaining the optimal configuration of parameters necessary to obtain a desired mechanical characteristic of the analyzed concrete.

O.P. 12 Advanced tools for optimization and efficiently monitoring behavior in service stage of buildings using renewable energy

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Abstract: In the topographical surveying works devices have got among the required accessories also tools called tripod. They have the role of correctly installing and settling the equipment above the station point in order to perform the measurements. Various types of tripods are known: the classic tripod (made from aluminum or wood), the adjustable laser tripod, the elevator tripod, the tripod for supporting and adjusting the picket. The aim of this scientific paper is to

present my invention that is concerned on a new type of tripod device with photovoltaic cells called solar tripod which has the purpose of providing the energy needed for the equipment used and thus extending the duration of survey measurements by using renewable energies. The tripod being an almost universal accessory along with other topographic instruments, it can be used for some topo-geodetic activities such as monitoring behavior in service stage of buildings, marking the points on the ground, determining ground elevations and other works that require a long time for the objects studied. This present work will describe the advantages and disadvantages of using the existing tripods compared to the new proposed device.

O.P. 13 Study of the relationship between the chemical, physical-mechanical and structural characteristics of the sheets and the characteristics of the use of welded pressure-pressure pipes

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Abstract: Ensuring the quality of metallurgical products with special characteristics are defined and described by international standards (ISO). Welded pressure pipes made of laminated sheet have the characteristics of use covered by EN 10217-3 and are dependent on the characteristics of the sheets manufactured in accordance with EN10028-3 / 2009.
The paper highlights the importance of meeting all the requirements imposed by the material norm and the manufacture of the laminated sheets in achieving the prescribed pressure characteristics of the pressure-pressure pipes as well as the connection relationship between them.

O.P. 14 Considerations on the characteristics of steels used in the manufacture of flat products for the manufacture of welded pressure pipes

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Abstract: The steels used in the manufacture of flat products for the manufacture of pressure welding pipes are fine-grained carbon steel or poorly alloyed with manganese, aluminum, nickel, vanadium, titanium and niobium delivered in laminated or normalized form, in the form of thick sheets normalized, normalized and returned or improved. The main uses of these steels are mechanical strength and especially low temperature tenacity. Designed for high-strength welded constructions, longitudinally and helically welded pipes for water, oil, gas, etc. have a high flow limitation (285 ... 460 N / mm2) and high tenacity up to -500C. At the same value of mechanical breaking strength, these steels have higher fatigue strength due to the finishing of the granulation obtained through the chemistry composition, the formation of chemical compounds as mechanical barriers to the growth of austenite grains on heating.

O.P. 15 Effects of the application of a non-conventional treatment in magnetic field on a steel for industrial gearings

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Abstract: An alloyed steel grade for machine parts construction used in industry have been considered and this material was subjected to a non-conventional treatment.
The samples have been tested using an Amsler stand for dry friction tests and the diffractometric analysis completed this study. The plasma treatment plant used was the INI 150 made by the Institute of Radiation Physics and Technology in collaboration with the "Electrotechnics" Enterprise and the Nuclear Apparatus (I.C.E.FIZ.) from Romania and was destined for technological research. The samples considered for tests were type rollers, with 10 mm width, with different diameters to obtain different sliding degrees {ξ), considering different values for the normal load (Q). This paper is a short review of the researches from last years.

O.P. 16 Aspects regarding the plasticity of the steel subjected to non-conventional treatments

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Abstract: Plasticity is an important property to determine the capability of the steel to support plastic deformations, to obtain pieces important for industry. It is important to know the optimal cooling regime for this material because the steel have been laminated at high temperature or, the steel have been heated at high temperature after lamination process.

It was considered a steel grade with a low carbon content, which can be find often in machine industry and in metallurgical operations. Three different mediums for directing of the cooling process have been considered and the properties of the steel have been modified.

This study try to determine a way to improve the properties of this kind of steel to obtain a higher durability corresponding to the exploitation conditions.

Section II: CASTING, FROM TECHNIQUE RIGORS TO ART (ARTCAST 2018)

O.P. 1 Degradation and deterioration of the parchmentused as support for old documents from archives

Author:**Maria Boutiuc (căs. Haulică),**

Co-author: Cosmin Tudor Iurcovschi, Ion Sandu, Viorica Vasilache,

Affiliation: Alexandru Ioan Cuza University of Iaşi, ARHEOINVEST - Interdisciplinary Research and Education Platform, Bld Carol I no. 22, 700506, Iasi

Abstract: The paper focuses on identifying and elucidating the mechanisms of degradation and deterioration of the parchment, used as support for old archive documents. These documents, besides the historical-documentary function, as a spring source for the history of social development, have other very important functions, related to aesthetics (artistic function), the nature of the materials and the technology of putting into operation (technical-scientific function) which make them to be classified as national cultural heritage assets. Explaining the phenomena that occur in time, leading to the change in chemical nature (alteration) or physical state (destruction), is a fundamental problem of preservation-restoration activity.
Keywords: degradation, deterioration, parchment, old documents, methods for investigation, preservation processus

O.P. 2 Study archaeometric characteristics of some ancient scrolls heritage

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Abstract: The paper presents a series of archaeometric features identified on old scrolls heritahe. Thus, using surface analysis methods (CIEL * a * b * reflection colorimetry, optical microscopy and UV, Vis and IR reflection), both traces of handling and use, as well as traces of material and formed traces from putting into operation.
Keywords: old parchments, scrolls heritage, archaeometric characteristics, surface analysis

O.P. 3 Study of tect extract influence on conservability old wood put into the work

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Co-author:Ion Sandu, Viorica Vasilache,

Affiliation: Alexandru Ioan Cuza University of Iasi, Interdisciplinary Training and Research Platform ARHEOINVEST

Abstract: The study focuses on assessing the conservation potential of tecton wood extracts (Tectona grandis) against decomposing organisms. Samples of teak wood (chips and sawdust) for evaluation were extracted into absolute ethanol, ethyl alcohol, isopropanol.

Tests were performed under laboratory conditions to evaluate the efficacy of tec extraction solutions. Solutions containing absolute ethanol extracts have obtained the best results in the resistance to slow degradation of the treated wood and significantly altered the resistance class of the treated species.

Natural resistance to microorganisms that destroy and alter wood components is a very important feature that determines the sensitivity of teakwood to fungi, xylophage insects, termites, etc. and is most often attributed to the presence of an extractable organic component with antimycotic or antifungal activity.

Keywords: teak wood, natural extracts, antimycotic activity, antifungal activity, wood protection, resistance to degradation

O.P. 4 Research on the use of ecological solutions for cleaning old icons

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Abstract. Due to microclimate factors, microbiological agents and anthropogenic activities, the old paintings suffer damage and degradation, often translated by aging materials in their composition.

Practically, these degradation effects could be diminished by stopping or ameliorating primary alteration processes that can be detected by careful monitoring of conservation status that takes into account the type and rate of degradation, the analysis of intimate deployment mechanisms by studying physical changes (CIE L * a * b *, optical microscopy, SEM-EDX, etc.) and the chemical, structural and dimensional characteristics of the paintings that take place over time.

The purpose of this paper is to study the effectiveness of new water cleaning systems and to evaluate their effects on old paintings, presenting multiple work protocols to demonstrate cleaning efficiency and time-based monitoring.

Keywords: old icons, aqueous systems, degradation and degradation, CIE L * a * b *, SEM-EDX.

O.P. 5 Chemical and structural characterization of chromium-based pigments extracted from hazardous sludge

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Abstract: The inorganic compounds synthesized from hazardous sludge were studied in order to use them in ceramic glazes as pigments. For this purpose chromium-based pigments have been obtained from galvanic sludge by precipitation of hydroxide or salts. The purity of Cr(OH)3, PbCrO4, BaCrO4 pigments was studied by using X-ray Fluorescence (XRF), X-ray Diffraction (XRD) and Scanning Electron Microscopy (SEM) techniques, highlighting the presence of small amounts of impurities which not exceed 1.2%. The established destination of these inorganic compounds imposed the study of their thermal behavior by subjecting them to a thermal treatment up to 800ºC. Also, the effects which occur in material and the mass loss associated were studied by using differential scanning calorimetry (DSC-TG) analyses. In order to investigate the stabilization of pigments on the ceramic surface by heat treatment, the ceramic/glaze interface (containing 10% pigments) was analyzed by SEM techniques and leaching tests. The results highlighted that chromium ion is stable in the solidified ceramic matrix.

O.P. 6 Determining the archaeometric and chemometric characteristics of the old documents. Paper support and writing

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Abstract: In order to valorize artifacts, it is necessary to investigate them, multilateral and in depth, by archeometric and chemometric studies. In the present paper, the authors present the analysis and comparative data on the chemical composition of some old documents from the "Poni - Cernătescu" Museum in Iasi, which possesses a valuable cultural heritage, including

furniture, books, documents, equipment etc. The study employed optical microscopy (OM) and scanning electron microscopy coupled with energy dispersive X-ray spectroscopy (SEM-EDX) techniques, in order to reveal the chemical nature of the documents taken in study.

O.P.7 Stages involved in preserving and restoring old icons

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Abstract. The aim of this paper is to review the essential work steps (prophylactic consolidation, cleansing, definitive consolidation, cessation of biological attack, staining, chromatic reconstruction, protection film) for preservation and restoration according to the principles of scientific conservation ethics involved in the cleaning of a cultural asset, which is considered to be true laws or codes of ethics, absolutely necessary to be observed in all interventions, from the acquisition to the display / capitalization / thesaurisation of a painting.

Keywords: preservation and restoration interventions, consolidation, biological attack, cultural good, old icons

O.P. 8 Research on obtaining ornamental glass objects by thermoforming

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Abstract: Thermoforming is the name of the hot glass making operation. This technique is commonly used in contemporary glass workshops, in addition to other techniques, and especially the one known as melting or fusing. Despite the apparent simplicity of the final application, thermoforming is a technical process, difficult to optimize, in which the material (glass) sometimes suffers significant deformations. Depending on the type of glass and its thickness, the heating time differs, and is determined by a curve defining the ratio of temperature to duration.
The process applies to the creation of lamps, chandeliers, contemporary glass, interior decoration, glass mesh, glass photographs, and all decorative objects that are obtained by melting glass bottles.

O.P. 9 Light Fusible Models Used for Small Dimensions Sculpture Casting

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Abstract: During the course of the study regarding the obtaining of artworks using light fusible models it has been highlighted the possibility of dividing the process of casting- molding in simple, separate operations whose execution becomes accessible even to people with no high qualification in the field.

An important realization during the study it is represented by the use of the dental molding-packaging mass which has ensured the obtaining of the smoothness of the surfaces and the clarity of form's configurations.

Designing the casting network has been the main preoccupation, in order to ensure the complete action of emptying the wax from the mold and filling it correctly with metal.

A special attention has been granted to cleaning and finishing the surface of the sculpture, this operation ensuring the texture of the future artwork.

Keywords: model, packaging mass, bronze, mold, casting network, cleaning, finishing.

Section III: UGALMat Nano8

O.P. 1 Microstructure and metallurgical phase composition in Fe containing intermetallics by Mössbauer Spectroscopy

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Abstract: The capabilities of ^{57}Fe Mössbauer spectroscopy in the complex investigation of the atomic local configuration and metallurgical phase composition in Fe containing intermetallics will be emphasized. Phenomena as atom clustering processes and changing the metallurgical phase composition under the influence of different thermal treatments in various atmospheres, under mechanical stresses or corrosive agents will be considered. Possibilities for an in depth investigation (100 nm surface layer, micrometer surface layer and bulk) via the different Mossbauer techniques (Transmission Mossbauer spectroscopy, X-ray detection after Mossbauer effects and Conversion Electron Mossbauer Spectroscopy) will be presented. Examples of results obtained on a wide range of systems (EUROFER steels, steels for water circuits, shape memory alloys, Fe-Cu and Fe-Rh intermetallics for different applications, shape memory and magnetostrictive intermetallics, exchange spring magnetic systems), either as bulk, ribbons or thin films will be provided.

O.P. 2 Thermomechanical processing effects on the structure and properties of Fe-based SMAs. I. Evolution of phase structure

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Abstract: The paper aims to analyze the effects of heat treatment (HT) and mechanical alloying (MA) on the evolution of phase structure in an Fe-Mn-Si-Cr-Ni Shape Memory Alloys (SMAs) obtained by powder metallurgy (PM). Five groups of specimens with chemical composition Fe-14Mn-6Si-9Cr-5Ni (mass.%) were produced by PM with five various amounts of mechanically alloyed (MA'ed) powders, from 0, 10, … to 40 vol. %, respectively. After blending, pressing and sintering, the billets were hot-rolled and heat treated (HT'ed) at five different temperatures 973, 1073, … and 1373 K, respectively. Tensile pre-straining tests were performed on the samples, with increasing pre-straining degrees up to 4.5 %, in order to stress-induce ε (hcp)

martensitic phase in the material. Structural analysis was implemented by means of X-ray diffraction and SEM observations. XRD and SEM investigations revealed the formation of thermally induced α'-bcc martensite, besides ε-hcp, as a particularity of this powder metallurgy, mechanically alloyed, shape memory alloy.

O.P. 3 Thermomechanical processing effects on the structure and properties of Fe-based SMAs. II. Evolution of damping behaviour

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Abstract: The paper analyses the effects of heat treatment (HT) and mechanical alloying (MA) on the evolution of damping behaviour of an Fe-Mn-Si-Cr-Ni Shape Memory Alloys (SMAs) obtained by powder metallurgy (PM). Using various amounts of mechanically alloyed (MA'ed) powders, from 0, 10, … to 40 vol. %, five groups of specimens with chemical composition Fe-14Mn-6Si-9Cr-5Ni (mass.%) were produced by PM with. Each set of samples were, after blending, pressing, sintering and hot-rolling was subjected to different heat treatment temperatures 973, 1073, … and 1373 K, respectively. From the 25 types of samples rectangular specimens were cut by wire-spark erosion for dynamic mechanical analysis (DMA) tests. DMA tests were performed by temperature scans (TS) and strain sweeps (SS). TS were applied between room temperature (RT) and 673 K, at constant amplitude, and enabled determining the temperatures of internal friction maxima associated with antiferromagnetic-paramagnetic transition (Néel temperature), A_50^N, and ε-martensite reversion to γ-austenite, A_50^ε, as a function of MA'ed fraction and HT temperature. SS were applied during three cycles of strain amplitude increasing, performed at three temperatures: (i) T₁=RT; (ii) T₂<A_50^ε and (iii) T₃ >A_50^ε. The effects of HT temperature and MA'ed fraction on storage modulus (E') values were emphasized for each of the three temperatures T₁,₂,₃. An E'-plateau was observed and associated with the formation of ε stress induced martensite, during DMA-SS.

O.P. 4 Multifunctional nanomaterials for waste water treatment. A review.

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Abstract: In the area of waste water purification, nanotechnology offers different possibility of efficient pollutants removal.
The utilization of multifunctional nanoparticles has opened new ways for environmental remediation. The exceptional characteristics resulted from nanoscale size, as absorption, catalysis and high reactivity of nanoparticles and nanomaterials shows the efficiency of removing various pollutants from wastewater. Cellulose nanomaterials is now very used because it has unique structure, and good mechanical and optical properties. While the paper and packaging, automotive, personal care, construction, and textiles industries have recognized cellulose nanomaterials' potential, we suggest cellulose nanomaterials have great untapped potential in water treatment technologies.
In this paper is presented an overview of recent advances in nanotechnologies for water and waste water treatment processes, based on the most studied materials as: nanoparticles (Ag, Fe and Zn), oxide nanoparticles as TiO_2, ZnO, Fe_3O_4 and hybrid materials based on hybrid nanoparticles (Ag, Zn, Fe, TiO_2, ZnO, Fe_3O_4)-polymers compounds (cellulose).
The main objective of this review is to provide recent information about the most important features of these nanomaterials and to show the advantages gained from the use of adsorbents containing nanoparticles modified biopolymers in waste water treatment.
The chemical contamination of water from a wide range of toxic derivatives, in particular heavy metals, aromatic molecules and dyes, is a serious environmental problem owing to their potential human toxicity.
Therefore, there is a need to develop technologies that can remove toxic pollutants found in wastewaters.

O.P. 5 Optimizing the electrochemical parameters to obtain a nanoporous aluminum oxide on 1050 aluminum alloy: A SEM-EDX study

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Abstract: In the last years, functional surfaces have received an increased attention due to human complex and diversified needs and in order to obtain materials with improved properties regardless the environment where they are used and to require a low production and maintenance costs. This work is focused on the study of the formation of an alumina (aluminum oxide) layer by double anodizing of aluminum. From this controlled oxidation method, a nanostructured porous layer with hexagonal cells was obtained. Ordered porous structures were obtained by applying sulfuric acid and a voltage-controlled procedure. The morphology of the surface and cross-section of the samples was analyzed by electron microscopy (Scanning coupled with EDX). The aluminum oxide layers formed by anodic oxidation are used in numerous domains, being used as anticorrosive protection method and as method for building decoration and architecture,

as method to improve the mechanical properties of aluminum and its alloys and as method to functionalization of aluminum and its alloys as templates to fabricate nanowires, nanotubes or nanoporous membranes, being known as a top-down method in nanotechnology.
In order to grow nanoporous aluminum oxide layers on 1050 aluminum alloy, the optimum electrolyte, the optimum methods to prepare the aluminum substrate and also, the optimum values of imposed electrochemical parameters in the anodic oxidation process to obtain nanoporous aluminum oxide layers with an uniform cellular structure were identified. The scientific research evaluate the influence of imposed electrochemical parameters in the anodic oxidation process on the morphological, structural, composition, roughness and wetting properties of the nanoporous aluminum oxide layers obtained.

O.P. 6 Corrosion behaviour of two types of naval steel in Black Sea water protected with modified polymeric coating by addition of TiO2 nanoparticles

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Abstract: Naval steels demonstrate unique properties such as high strength, excellent ductility, good weldability and also have exceptional impact strength at low temperatures, superior to resistance to other steels used in industry. The major problem for all structures, devices, equipment that operate and exploits the marine environment is their poor corrosion resistance. The industry has developed a number of polymeric coatings to protect the naval steels from corrosion process. Corrosion of carbon steel in marine environment becomes serious due to the highly corrosive nature of seawater. As marine environment containing a vast array of substances, metals and alloys will be damaged due to specially the presence of chloride ions in seawater.
The aim of this paper is to evaluate the corrosion behaviour of two types of low-alloy naval steel against corrosion. The naval steels chosen for this research are EH32 and EH36. The samples of EH32 and EH36 steel have been studied both in uncoated condition but also covered with polymeric primer. They were also covered with polymeric primer modified with ceramic TiO2 nanoparticles.
For the corrosion experiments, all samples were subjected to corrosion in seawater collected from the Black Sea. The corrosion properties were studied using electrochemical methods such as: open circuit potential (OCP), polarization resistance (Rp), electrochemical impedance spectroscopy (EIS) and cyclic volatmmetry (CV). The polymeric coating modified with dispersed inert TiO2 nanoparticles is able to offer higher protection to steel against corrosion, and performed relatively better than other polymeric coatings.
Keywords: Marine corrosion, polymeric coatings, nanoparticles, electrochemical methods.

O.P. 7 Considerations regarding the use of SU-8 negative photoresist in microfluidic systems

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Abstarct: This paper describes a comparison (SEM, optical-microscopy characterization) of two microfluidic channels from devices used to determine different cells from the blood. The microchannels are fabricated in SU-8 photoresist, and have different dimensions: 15 µm and 25 µm (depending on the cells we want to determine). SU-8 is used in the photolithography and presents excellent chemical resistance, high transparency, it is biocompatible and shows strong adhesion.
Two devices used in biomedical purpose were prepared for this paper. The first one is used for determing the T-cells from the leukocytes. It has a 15µm dimension of the channel through which the cells pass in order to be counted and a distance of 12µm between the pillars that are inside the capture chamber. The second one is used for determing the circulating tumoral cells (CTCs) and has a 25µm dimension of the channel and a 20µm distance between the pillars. The parameters (temperature, time) used for the photolithography in order to obtain the thickness are presented, and also the other steps, like pre-bake and after-bake.
The determination of T-cells and CTCs in our days involve costly flow cytometry techniques which require long periods of time for preparing samples and analysing them. With the help of these devices the time and costs are significantly reduced.

O.P. 8 A study on specific heat of nanoparticle enhanced fluids

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Abstract: A real necessity in the field of materials engineering and beyond is the development of materials that effectively combine state-of-the-art technology with competitive costs to meet current technical requirements and challenges. In our world, fluids used in engineering occupy a significant place, and for their application in the industry, special thermophysical, thermal and chemical properties are required.
Nanofluids are a new fluid that contains nanometric particles, called nanoparticles. Traditional fluids used as base in nanofluids are water, oil and ethylene glycol, and nanoparticles are typically made of metal oxides, carbides or carbon nanotubes. Ionanofluids, on the other hand, are new heat transfer fluids based on ionic liquids, with superior thermal properties compared to the

conventional fluid. Ionanofluids are recently developed by adding nanomaterial particles to an already novel fluid, as the ionic liquid.
From the literature available, it is easy to understand that a new heat transfer fluid should have good thermal and flow properties and the iononofluids thermophysical properties can be improved by juggling with the amount and type of nanoparticles added in the ionic liquid.
The goal of ionanofluids development is to obtain the highest possible thermal properties at the lowest possible concentrations, thus this paper aims to experimentally study the specific heat of these new nanoparticle enhanced fluids.

O.P. 9 Modification of YAG:Ce phosphor properties by Gd codoping and silanized with APTES

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Abstract: Yttrium aluminum garnet (YAG) phosphor is a material with few applications in this form, but by doping with different metal ions can find its usefulness in many areas. By doping with one or more cations like Ce, Eu, Gd, Tm, Cr etc. it can be used in different applications from optoelectronics (i.e: YAG:Ce,Gd for white light emission) to biomedical (i.e: YAG:Ce for fluorescence markings) or aerospace industry (i.e: YAG: Cr for thermal barriers) etc. The use of the YAG:Ce phosphor in optoelectronic applications for white light generation is limited by the lack of a red component in the emission spectrum, which requires the necessity of finding methods such as codoping or modifying the surface for moving the spectral band to longer wavelengths. Also, doped garnets are insoluble materials, with high hardness, with a very high tendency of agglomeration and chemical inertia, which makes it necessary to modify the surface of these particles. In this paper we presente a sol-gel method for modification of YAG:Ce phosphor properties by codopping with Gd3+. In order to improve properties and broaden the field of applications, a surface modification method is developed by silanization with APTES. The quality of the phosphors obtained was confirmed by the structural and optical study, thus confirming the obtaining of materials with improved luminescent properties and high purity for optoelectronic, aerospace and biotechnologies applications.

O.P. 10 Studies and researches regarding the obtaining of multifunctional nanocomposites coatings

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Abstract: The paper presents the preparation of ZnO - SiO2 nanocomposite coatings by successive layers deposition using sol-gel method, dip-coating technique. The influence of the drawing speed and number of layers on the film morphology, optical properties and corrosion resistance was monitored. It has been found that the increase in the drawing speed and the number of layers results in increased film thickness and modified film morphology by spherical restructuring. The films deposited on a glass substrate have a transparency ranging from 45-90% in the VIS-NIR range depending on the thickness film. In the case of non-transparent substrates, it has been found that these films diminish the reflectivity due to the surface morphology and the presence of ZnO nanoparticles that absorb some of the light radiation. The corrosion test has showed that all of the films deposited provide superior protection to the substrates used.

POSTER SESSION

P. 1 The antimicrobial potential of metallic nanoparticles obtained through chemical and biological routes

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Abstract: The bio-nanotechnology used in the last years in the synthesis process of nanoparticles has become a major focus due to its lack of toxicity, which is frequently encountered in chemical processes. The biosynthesized metallic nanoparticles using biological entities (microorganisms, viruses, plants) like reducing agents and stabilizers are more pointed to be applied in antimicrobial activity because of low-cost and simple approaches of the synthesis process. Until now it has been demonstrated that bacteria, algae, fungi and yeast posed properties in nanoparticles synthesis, which could be applied against different microorganisms leading to a vicious circle (microorganisms are used in synthesis of nanoparticles, then the biosynthesized nanoparticles are used to damage the microorganisms). It has been found that silver, gold, platinum, copper are the most studied kinds of nanoparticles obtained through green route, while Bacillus and Pseudomonas species are the most used bacteria in biological synthesis process. The aim of this study is to show a comparison between the antimicrobial strengths of metallic nanoparticles, with particular shapes and dimensions, developed behind of biological and chemical synthesis method. The synergism developed between metallic nanoparticles and different antibiotics is also highlighted in this work against microorganisms like Escherichia coli and Staphylococcus aureus. The nanoparticles with antimicrobial potential could be applied in several biomedical application.

P. 2 Thermodynamic property of interstitial alloy FeH with BCC structure under pressure

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Abstract: The analytic expressions of the mean nearest neighbor distance, the free energy and the thermodynamic quantities for interstitial alloy AB with body-centered cubic (BCC) structure under pressure are derived by the statistical moment method. The theoretical results are applied to interstitial alloy FeH. Our calculated results for main metal Fe are in good agreement with experiments.

Keywords: binary interstitial alloy, statistical moment method.

P. 3 Thermodynamic properties of FCC interstitial alloy AuSi with defects

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Abstract: The analytic expressions for the free energy, the concentration of equilibrium vacancies and thermodynamic quantities such as the isothermal compressibility, the thermal expansion coefficient and the heat capacities at constant volume and at constant pressure of FCC interstitial alloy AB with defects under pressure are derived by the statistical moment method. The theoretical results are applied to alloy AuSi with defects. Our calculated results for main metal Au with are compared with the experimental data.
Keywords: interstitial alloy, concentration of equilibrium vacancies, statistical moment method

P. 4 Achieving ultra-fine grained microalloyed steel by severe plastic process

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Abstract: Latterly, it is of interest to enhancecombination of strength and toughnessofsteel for advanced products, therefor the objective of this research is to improve the mechanical properties ofhigh strength low - or ultra - low alloy (HSLA) steels through grain refinement. The ultra-fine grained S420NL steel were produced by high speed high pressure torsion (HSHPT) at room temperature.This severe plastic deformation method was chosen because it is one of the most feasible and rapid ways for nanostructuring various metallic materials down to ultrafine grain range. The procedure key parameters of deformation are described in detail in the paper.The influence of severe plastic deformationapplied in cast state steel on microstructure changes and deformation behaviour was investigated.Optical microscopy, SEM and energy dispersive x-ray spectroscopy (EDX) analysis carried out on the samples revealed that severe plastic deformation led to the subsequent formation of an ultrafine-grained microstructure. Sample hardness increased rapidly with progress of torsion deformation degree.

P. 5 Use of biodegradable sorbents to the decontamination of polluted soils

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Abstract :The paper presents the decontamination of soils polluted with diesel, oils and other petroleum products. Soil decontamination is applied in-situ and ex-situ, depending on the surface and depth of the polluted area. The treatment time was 152 days, after which total hydrocarbon oil concentrations decreased for all experimental samples. The highest efficiency in reducing the concentration of petroleum products was in the case of samples treated with biodegradable sorbent and in the case of those treated with biodegradable sorbent mixture and biological sludge. Biodegradable non-waste materials have been used. The risk of migration of deep pollutants is low in the ex-situ version. Decontamination time is longer for high yields. In the case of older pollution, decontamination yields are low due to the presence of some 35% compounds, which do not migrate and are difficult to biodegrade under normal conditions.

P. 6 Manufacturing and characterization of metal matrix composites with SiC granular particles

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Abstract: Composite materials with granular particles have emerged as a result of satisfying an extended range of needs, such as improving mechanical properties, reducing specific gravity, recovering a high proportion of SiC granular particles for environmental pollution reduction and conferring of new destinations to use. A new intended use of the metal matrix composites with granular particles is in steel making technologies, as a raw material used in the deoxidation stage and for the corrections made to the re-carburation. The method of manufacturing used is the mechanical mixing by vibration of an aluminium based alloy melt with granular particles at the temperature of 750°C. The advanced reuse of granular particles smaller than 0.8 mm by embedding them in an A6061 aluminium alloy matrix was one of the main purposes ot research. Also, the thermal, structural and physico-chemical properties of the composites were analyzed in order to determine high embedding efficiencies in the processes of steel production. Composite materials obtained were characterized by optical and electronic microscopy methods, EDX chemical analysis, structural X-ray diffraction analysis and DSC thermal analysis.

P. 7 Thermal analysis of fabric reinforced hybrid epoxy plates

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Abstract: In this research, it was analyzed the specific heat and the coefficient of thermal linear expansion of fabric reinforced hybrid epoxy composites with fiber orientation at various angles. The carbon, glass and aramid simple plain fabrics were used as reinforcements. The medial layer of the composite materials was made of a special hybrid fabric with three alternating different fibers (carbon, aramid and glass) and tinned copper wire. Different types of fillers were added in epoxy matrix as aramid powder, carbon black, potatoes starch, barium ferrite for improving thermal response of hybrid composites. The results revealed that the thermal behavior of investigated composite materials depends on their layer configuration and fillers addition in epoxy matrix. It was obtained that the fillers addition affected the specific heat and the coefficient of thermal linear expansion. It was observed the contracting process of structure of hybrid epoxy plates with outer layers made of carbon fabric and filled epoxy matrix on 40°-60°C temperature range in case of thermomechanical analysis, where the thermal linear expansion coefficient showed negative values.

P. 8 Antibody functionalized magnetic nanoparticles for circulating tumor cells detection and capture using magnetophoresis

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Abstract: Circulating tumor cells (CTCs) are cells present in the blood stream during the metastasis process. They can originate from primary or secondary tumors.
Circulating tumor cells can be used for early diagnosis or they can be used for prognosis evaluation and even treatment efficiency evaluation. Circulating tumor cells can be captured based on specific antigens found on their surface that differ from those of normal blood cells, they can be captured using specific electrical signatures using dielectrophoresis and they can also be captured using induced magnetic properties and magnetophoresis. In this paper we describe a method for synthesizing and functionalizing superparamagnetic nanoparticles. The nanoparticles will be covered with polyethylenglicol (PEG) molecules to reduce agglomeration and non-specific cell adhesion or blood proteins fouling. The PEG covered magnetic nanoparticles will be functionalized with anti-EpCAM antibodies that are going to make the nanoparticles specifically

bind to CTCs present in the blood sample. The samples will be further processed in a microfluidic device that will separate the targeted cells through magnetophoresis.

P. 9 Oxinitrocarburizing technology in fluidized bed applied to drawing steels

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Abstract: Steels oxinitrocarburizing is a thermochemical treatment in order to obtain a slight increase mechanical properties associated with increased corrosion resistance. Developed the paper is based on experiments performed on a plant with fluidized bed. Environment for oxinitrocarburizing is achieved by means of fluidized solid granules sorted by size 0.10 ... 0.16 mm, resulting from decomposing a gas mixture of methane and ammoniac (initially). Samples are used in low carbon steels. Controlled oxidation is performed at a temperature of 570°C with superheated water vapor. The results confirm the increase of surface properties and corrosion resistance.

P. 10 Improving the powerful behavior of an experimental model of savonius turbine (s-rotor) with coupled aerodynamic additional blades

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Abstract: The proposed experimental model brings an improvement in the start of turbine rotation and a torque uniformity in load. Constructively, the original blades of the turbine have gap and overlay. Additional blades are placed at 90° from the classic layout of the blades at the Savonius turbine and are attached to the original blades. The model was tested on the wind tunnel at low wind speeds (<4.5m / s). The results confirm the validity of the concept, without significantly increasing the yield of the experimental model.
Keywords: Savonius Turbine, S-rotor, adjacent blades

P. 11 Load behavior of a wind turbine model with a four-bladed vertical axle coupled periodically aerodynamic

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Abstract: The paper is based on experiments conducted on the wind tunnel at low wind speeds (<4.5m / s), on an experimental wind turbine model of the Savonius type with four blades and a D / H ratio of 2.6. The four blades are periodically coupled aerodynamically. The model acted a DC generator with a speed multiplier. Experiments were performed by modifying the generator's electrical charge. The results confirm the validity of the proposed concept.
Keywords: Savonius rotor, low wind,

P. 12 Modifying the structure and surface properties of ti6al4v alloy by carbonitriding in fluidized bed

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Abstract: The Ti6Al4V alloy is known of being one of the most used biocompatible alloys and not only that. The study is based on the experienced research of the hardening in a fluidized bed and applied to samples of Ti6A14 in laboratory conditions. The carbonitriding has been accomplished on a exterior electric heating reactor. There has been examined the influence of the heat and the duration of the thermochemical treatment out of economy interests, the flow has been made with a mix of CH4 and NH3 (5% concentration). The results have been examined through hardness (HV5), metallographic microstructures and microhardness in section .
Keywords: titan alloy, Ti6Al4V, carbonitriding, FBT, Fluidized bed

P. 13 Coarse-Grain Heat Affected Zone study of the welded X70M steel destined for oil industry

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Abstract: Oil and gas transport poses an important challenge to the society we live in. Steel pipes are most used to transport these natural resources. Breaking of welded pipes can lead to environmental pollution, but also to large industrial losses. Most damages occurs on welded sectors of pipe-lines, welding process being used to actual manufacturing of pipes, as well as for joining pipes together. Different aspects such as composition, morphology, structure, non-metallic inclusions, residues have an important role in causing breaking of welded pipes.

The main objectives of this research are: to analyze the structure and mechanical properties of a submerged arc-welded X70M (according to API 5L/ ISO 3183-2012) steel pipe and to determine the role of the microstructure in initiation and propagation of the damage in HAZ (*Heat Affected Zone*).

Micro examinations of HAZ and fracture surfaces were carried out using *Optical Microscopy*, *Scanning Electron Microscopy* (SEM) and *Energy-Dispersive X-ray Spectroscopy* (EDX). Mechanical properties were characterized by *tensile tests*, *Drop Weight Tear Tests* (DWTT) and *Charpy V-Notch tests*.

P. 14 Analysis of the propagation of defects generated by the oscillation marks on laminated products

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Abstract: In this work was followed the determination of a method of diminishing the depth of the oscillating brands and identifying how the oscillating brands can influence the surface quality of hot rolled products (backgammon and strips). This study addresses the phenomena that take place at the initiation of the crust in the crystallizer and treats the theoretical aspects of the formation of the oscillating brands on the surface of the cast products continuously. Experiments carried out have allowed to reveal aspects regarding the relationship of oscillation brands – the quality of the products (moulded or laminated) and the purity of the continous cast slabs.

P. 15 Environmental risk assessment a secondary dedusting plant within steel hall

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Abstract: The steel industry is one of the most developed industrial branches in the world, achieving more than 75% of the value of the entire metallurgical industry. The Romanian steel industry is a particularly important industrial branch for the national economy because it is a multiplier of: gross value added, industrial production, jobs, tax generator and taxes etc. At least 50% of the raw materials used in the industry contribute to the formation of industrial waste, of which around 15% may be considered as toxic or harmful to the human body. In the OLD1 section was mounted in the year 2008 a dedusting installation of the steel Hall (secondary dedusting). The new equipment allows for an efficient capture of the gas and dust emissions that occur when loading or unloading the cast iron from the Torpedo pots, which will bring about a massive improvement in environmental conditions. The capacity of the dedusting is 2.5 million cubic metres per hour. Stopping this installation (not diminishing exhaustarii) can generate under

the new "environmental protection" legislation an environmental accident with a major impact on environmental contamination and affecting the image of the company. Emissions of pollutants in the industry are very rich and very diverse. The circumstances that favour the occurrence of the risk are: Defectuasa functioning of the dedusting; Damage in the installation; Water infiltrations; Advanced state of wear of dust bags; Inlet valves loading converters; Faulty automation; Manual operation. The measured measure consists in: verification of the OLD secondary dedusting according to the inspection programme and implementation and compliance of the maintenance plan.

P. 16 Studies and research on determining the cause of the cracking of X60 pipeline in the expanding operation

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Abstract: In this paper was followed the determination of the cause of the pipe cracking in the expansion operation. The metallographic analysis of a sample taken from the X60 pipeline was performed to determine the cause of the pipe cracking. The structure of the material presents the following defects: linear macroinclusions type silicates fragile, which layer the material and affect virtually all the thickness of the board; linear segregations in carbon, thickness 0.4 – 1.5 mm; segregatii area in sulphur, and linear segregation in sulphur at the half thickness of the board; in the area of the fissure, the presence of hard particles, with the hardening structure, which influenced the normal flow of steel to deformation. The presence of hard particles, with the hardening structure, in the rift area influenced the normal flow of steel to deformation. The presence of the overlay formed in hot lamination on the surface of the board indicates the existence of a material defect, which changed the normal flow of the material during deformation. At the expansion operation, in the area of overlap of the material, due to this structural inhomogeneities, the limit of breaking resistance was exceeded and the material was cracked on about 90% of the thickness of the table.

P. 17 Studies and research on water pollution in Galati urban area

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Abstract: The purpose of the work was the study of wastewater treatment at the Galati sewage Station in June, August 2017 and January, February, April and May 2018. The treatability can be expressed by removing the total organic substances from the water (determined by cco or cot tests) or by removing equivalent substances (determined by the CBO test). The reduction of CCOCr and CBO5 from wastewater after passing through the installation of the Galati treatment

station is an estimate of the quantity of organic substances removed in the treatment process. As a result of the determination of the concentration of organic substances in the influence and effluent of the Galati treatment station, the following were found: The Symons environmental treatment ratio achieved for influence was 0.554 which framed the influence in S.E. Galati in the category of wastewater readily treatable by biological methods, in the presence of naturally occurring micro-organisms in these waters. Another criterion for assessing the treatability of wastewater is the efficiency of reducing CCOCr and CBO5. The efficiency of reduction of CCOCr (81%) and CBO5 (84%) allow for the characterisation of wastewater as a biological treat in S.E. Galati and alongside the operation at optimum parameters of treatment plants.

P. 18 Influence of Pressure-Assisted Thermal Processing (PATP) on the thermal behavior of polymer films used as packaging material in the food industry

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Abstract: From the industry point of view, the most important aspect when processing foods is safety which should be carefully monitored during the manufacturing, storage and beyond distribution until food reaches consumers. The development of new minimal processing techniques, such as high pressure processing (HPP), brings in alternatives to conventional processing that are able to better balance between the nutritional properties of foods, the intensity of processing and their safety, giving to consumers fresh-like foods. Due to relatively limited information available concerning the changes brought by the combined high pressure and thermal treatment and the abundance of new multilayer polymeric packagings on the market intended for HPP, it was necessary to study the effect of pressure-assisted thermal processing (PATP) on selected polymer films used as packaging materials.

The effect of PATP treatment on two polymeric packaging films used in meat industry: Pev-70 (co-extruded high barrier multilayer film with PA / EVOH / PA / PE) and Pob-60 (combination of biaxially oriented polyamide with a coextruded barrier film of the structure polyethylene / EVOH / m-polyethylene) was evaluated. The parameteres of the PATP treatment applyed are selected to give anequivalent to thermal sterilization, so that the packaging material used should not only withstand pressure but also to be adequate for thermal treatment. So, the purpose of this study was to identify the conditioned limits by PATP on selected polymeric films used as packaging material in terms of their thermal properties. The changes of thermodynamic parameters could also be attributed to thermal damage occurring during preheating, a compulsory step when applying PATP.

In order to evaluate the thermal properties of the films used as packaging materials, DSC analysis of the unprocessed polymer films and polymer films processed at 600 MPa combined with temperature 70 ° C for 10 minutes was performed. The endothermic curves (melting) highlighted the melting temperature (Tm) and the melting enthalpy (ΔHm) for each polymer was

determined. From DSC analysis in the temperature range of 40-200 °C, it was found that the PATP treatment has induced low modification of the thermal properties of the analyzed multilayer polymer films.

P. 19 Study on the changes induced by the Pressure-Assisted Thermal Processing (PATP) in polymer films used as packaging by the meat industry

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Abstract: The quality of packaged food is directly dependent on the properties of the food and the packaging material. Before a new technology occurs on the market, the effect of the technological parameters on both food product and its packaging material, should be carefully evaluated. Pressure-Assisted Thermal Processing (PATP) is a process involving the combined effect of high pressure (300-700 MPa) and temperature (90-120 °C) over a short period of time in order to obtain an equivalent effect to the thermal sterilization, with less variations in the packaging-food system, allowing to obtain safe and superior nutritional products and to reduce the use of certain additives.
The purpose of this study was to assess the changes induced by PATP treatment in two multilayer polymer films used as packaging material by the meat industry.
The changes induced by the treatment at 600 MPa, 70 ºC for 10 minutes on the structural, mechanical and thermal properties of two multilayer polymer films (Pev-70 coextruded high barrier multilayer film with the structure PA / EVOH / PA / PE and Pob-60 combination of biaxially oriented polyamide with a co-extruded barrier film of the polyethylene / EVOH / m-polyethylene structure) were studied. These polymer films are intended for meat packaging.
Numerous changes induced by the PATP treatment on the structural, mechanical and thermal properties of the two multi-layered polymer films used as packaging materials in the meat industry have been identified. The choice of a packaging material according to the PATP treatment requires a better understanding of all the changes induced by this treatment. So, this study has preliminarily identified a part of those changes that occurs and could irreversible affect the quality of foods.

P. 20 Macroscopic, microscopic and microdurity vickers HV1 analyzes of MAG-M mechanized deposited welding cords in horizontally position with solid and flux-cored wires

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Abstract: The paper presents the macroscopic, microscopic and microdurity Vickers HV1 analyzes of MAG-M mechanized deposited welding cords in 1G position where used a different welding wires of 1.2 mm diameter, such as solid wire (ER70S-6), rutile flux-cored (E71T1MH4), metal-cored (E70C6MH4). Two-gases mixture, comprising 82% argon and 18% carbon dioxide, known as M21 (Corgon 18) shielding gas, was used during experiments to protect the contamination of the molten weld pool against oxygen, nitrogen, and hydrogen. Welding was performed on a stand equipped with universal source Phoenix 405 Progress puls MM TDM and K-BUG 5102 tractor. The paper presents the way of deposition of the welding cords on the plates, the analyzes performed and the final conclusions of the experimental researches.
Keywords: MAG-M welding, solid wire, metal-cored wire, rutile flux-cored wire, shielding gas mixture.

P. 21 Analysis of corrosion resistance of EH36 and butt welded joints in sea water

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Abstract: Naval grade high strength low alloy (HSLA) steels can be easily welded by all types of fusion welding processes. However, fusion welding of these steels leads to the problems such as cold cracking, residual stress, distortion and fatigue damage. The steel have a poor resistance in marine environment. The corrosion is big issue for metallic materials which have contact with the marine environment, implicitly with the action of sea water. In this investigation a comparative assessment of corrosion resistance of some welded joints was performed using EH 36 steel base material. Butt welded joints were made using the MAG-M mechanized process with flux-cored wires on ceramic support, in two welding positions uncomfortable 4G - overhead and 3G - vertical wall. The analysis of corrosion behavior was done using electrochemical methods. Samples made from welded joints were immersed in natural seawater collected from the Black Sea. Corrosion behavior has been studied using electrochemical methods such as open circuit potential (OCP), polarization resistance (Rp) and cyclic voltammetry (CV). The results showed similar behavior for corrosion resistance of welded joints in the marine environment, similar to that of the base material.
Keywords: MAG-M welding, metal-cored wire, rutile flux-cored wire, shielding gas mixture, corrosion.

P. 22 Influence of seawater on submerged dry hyperbaric welded joints

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Abstract: The authors analyzed in this paper the influence of sea water corrosion butt joints underwater MAG-M hyperbaric dry powder to the metal organic cored wire. Welding was performed in 3G position, the underwater hyperbaric welding simulator dried overpressure of 2 bar to 4 bar. Sample plates were made of 14 mm thick EH 36 naval steel. The electric arc protection was provided by the Corgon 18 gas mixture. The corrosion properties of EH 36 steel as well as the adduct for welding sealed joints have been studied using electrochemical methods such as open circuit potential (OCP), cyclic voltammetry (CV) and polarization resistance (RP). The results showed a similar behavior to the corrosion resistance of welded butt joints dry hyperbaric underwater surface close tob those of the base material.
Keywords: metal active gas welding, low fume metal-cored wire, gases mixture, electrochemical corrosion, marine corrosion

P. 23 Research on dry hyperbaric underwater mechanized mag-m welding with ecological cored wire

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Abstract: The work presents experimental research on the welding underwater dry hyperbaric MAG-M in the position of the PF (3G) on flat ceramic support using E70C6MH4 ecological metal cored wire with 1.2 mm diameter and M21 gas mixture (Corgon 18). During the welding were used EH36 steel sheets with dimensions 500x150x14 mm, processed in V (narrow aperture of 40o). The welding was carried out in the dry hyperbaric underwater simulator at overpressures of 2 bar and 4 bar. A Aristo Lud 320 universal source and the Railtrac FW 1000 tractor were used for sample welding. The paper presents welding, non-destructive and destructive controls and final conclusions of experimental research.
Keywords: underwater welding, ecological metal-cored wires, shielding gas mixture

P. 24 Formation of submicrocrystalline structure in a biodegradable Mg alloy

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Abstract: Magnesium alloy, as biodegradable material, are attracted increasing interest in the field of bone graft substitution due to their excellent biocompatibility and good corrosion resistance. The main clinical challenges of ZK60 Mg alloy remain requirements such as:straight, fracture resistance, work hardening mechanical shock and so on, concomitant with plasticity. According to the Hall-Petch theory, aneffectively enhance strength of Mg alloys may be realized by grain refinement. This paper proposes a reliable approach to fabricate Mg cast alloys down to ultrafine-grain range within just a few seconds. Ultrafine grained (UFG) Mg alloy was produced by severe plastic deformation (SPD), using high speed high pressure torsion (HSHPT) procedures. The microstructure evolution of the as-cast and as-severely deformed Mg-Zn-Zrwas characterized using optical microscopy, electron microscopy and energy dispersive spectroscopy (EDX). X-ray diffraction analyses (XRD) was performed to study the impact of severe plastic deformation on internal structure changes. Microhardness tests indicated significant increase with the progression of true strain.Results so far have been very encouraging in developing new solution for biodegradable applications.

P. 25 Phase transformation and structural study on the severely deformed cooper based shape memory alloy

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Abstract : We report on the changes on microstructure and phase transformation in a Cu-based shape memory alloy (SMA) due to severe plastic deformation realized via high speed high pressure torsion (HSHPT) technique. The aim of our research was to broaden current knowledge of nanostructured Cu-based SMA and opens the way for applications with tailored superelastic and shape memory effects (SME). The structural evolution in the $CuAl_{13}Ni_4$ samples subjected to HSHPT reveals a strong refinement in martensitic state. Applying HSHPT processing to the $CuAl_{13}Ni_4$ alloy yields ultrafine grained phases contained mainly β′3 martensite with a certain amount of γ′3 martensite. The change in the phase transformation temperatures after severe plastic deformation (SPD) are analyzed by studying Differential Scanning Calorimeter (DSC)

plots. Increasing the degree of deformation applied, a strong broadening of the martensitic transformation temperatures is observed. In order to confirm the functionality of the $CuAl_{13}Ni_4$ SMA some diffraction measurements (XRD) were performed on heating and cooling, from -50^0C to $+150^0$C. The results outlines that this SPD drives a combination of diffusive transformations (precipitation) and displacive (martensitic) transformation. It is important to note that all the Cu-based SMA samples after HSHPT present reversible martensitic transformation. The shape memory effect is not suppressed. The post-deformation treatment is not necessary as in case of others SPD methods.

Keywords: HSHPT, SPD, shape memory alloy, UFG, Cu-Al-Ni

P. 26 Structural evolution of theNiTi/NiFeGaCo smart hybrid material during severe plastic deformation

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Abstract: High speed high pressure torsion (HSHPT) a patented new approach is proposed to fabricate nanocomposites.The goal of this work is to investigate the NiTi/NiFeGaCobilayer hybrid material with nano- and submicrocrystalline structure under the influence ofHSHPT.Apart from the grain refinement,the effectiveness of the jointare revealed by optical microscopy (OM), scanning electron microscopy (SEM) and transmission electron microscopy (TEM). The mechanical properties of the compositelayers in bulk and after severe plastic deformationare investigated. Bi-layered composite disks consisting of NiTishape memory alloy and NiFeGaCo,Heusler type alloy, exhibit simultaneously ferromagnetism and thermoelastic structural martensitic transformation.Submicrocrystalline structure is formed in the both layers of the hybrid material. It is also ascertained significant hardening of each layer of the hybrid as a result of HSHPT. The results highlight market differences between the bulk and the hybrid and the role of severe plastic deformation on martensitic transformation.

P. 27 Need for selective collection

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Abstract: Selective collection is a necessity but also an obligation. To do this, the bottom-up and top-down information flows must be activated: family, school and tenant associations, local government and sanitation companies. The success of the activity must be based on an information and awareness campaign on the necessity and appropriate endowment with waste sorting facilities and facilities.

P. 28 For a clean environment, selective collection of waste is a civic duty of each of us

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Abstract: Selective collection of waste is not only an obligation but also a civic duty of each of us. Waste can be structured in: Waste products, packaging, biodegradable household waste, plant debris in gardens and green areas. The success of the action must be based on two ideas: 1-turning waste into a source of valuable raw materials, 2-stimulating the population for active and conscious participation.

P.29 Effect of rolling mode on the morphology and mechanical properties for HS340LA steel

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Abstract: High-strength low-alloy (HSLA) steels constitute a classic metallurgical development in which alloying additions and thermomechanical processing have been brought together effectively to attain desired combinations of engineering properties through microstructural control. A key feature of the resulting microstructure is the small ferritic grain size that provides a favorable balance of strength and toughness in the as-rolled steel.

The main goal of this study was to present the influence of rolling mode and deformation degree on morphology and mechanical properties for HS340LA (High strength low alloy) coils steel, according to EN10268-2006, grade that belongs to class steel having low content of Carbon (max 0.1%C), used in automotive industry (fabricated in ArcelorMittal Galati).

Mechanical properties of steel were characterized by *tensile tests*; the evolution of its microstructure (nature, shape, distribution, crystalline grains, etc.) developed by bidirectional rolling process, mass concentrations of alloying elements and impurities contained in steel, were analyzed by *Optical Microscopy*, *Scanning Electron Microscopy* (SEM) and *Energy-Dispersive X-ray Spectroscopy* (EDX).

P.30 Mathematical modeling and optimization of the thermomecanic treatment process applied to AlZn4.5Mg1Cu Alloy

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Abstract: The paper presents the results of the experimental researches as a result of applying the thermo-mechanical treatment for the AlZn4.5Mg1Cu alloy used in the aeronautical industry, in order to optimize the processing parameters.
The research is based on a laborious experimental thermomechanical processing program applied to AlZn4,5Mg1Cu aluminum alloy to obtain certain imposed values of the mechanical properties with the lowest possible expense.
The objective function in the optimization of the investigated thermomechanical treatment regime is the energy consumption "Q = f (t, τ, ε)" taking into account some restrictions regarding the values of the investigated mechanical properties.
The best value for the objective function is by determining values for the independent variables of the thermomechanical treatment process, for which the conditions for obtaining values imposed on variables dependent on minimum energy consumption Q are met.

P. 31 Mathematical model for the optimization of preparation and delivery flows at lbc adjustment

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Abstract: In the paper, the mathematical model of the sheet metal coil handling process was realized in the LBC Adjustment section of Arcellor Mittal S.A. Galati. Mathematical modeling is performed by statistical methods, namely active regression analysis.

Modeling methods by experiment programming are very different because metallurgical processes are varied and complex.

We considered the main factors influencing (the independent variables) the following parameters of the studied process:

1 - the number of rolls - n (number of rolls / entered in the section for 8h);

2 - number of cranes - m (number of cranes / cranes from the LBC fitting section).

In order for the problem to be solved, the optimized function must have a physical meaning, be numerically expressed and show extreme values.

The objective function for optimizing the flow of roll preparation and delivery flows from the LBC Adjustment section is the storage space with some restrictions.

The best value for the objective function is by determining values for the independent process variables, for which the conditions for obtaining values imposed on variables dependent on minimum energy consumption Q are met.

P. 32 The structural analysis of the material resulting from the destruction by explosion of a compressed air cylinder

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Abstract: In this paper is presented the structural analysis carried out on samples from a compressed air cylinder subjected to explosion. The air cylinder was mounted on public transport bus.

The risk that the incident would repeat with other similar cylinders carrying compressed air required a detailed study regarding the causes that led to the catastrophic degradation.

The research by micro and macro structural analysis has highlighted several factors that have increased the damage.

The optical micrographs are obtained using an Olympus metallographic microscope equipped with a digital camera, with the possibility to automatically assign the microstructure magnification and with automatic software for linear measurements.

The research regarding the appearance of the inner surface of the compressed air cylinder container has highlighted an accentuated corrosion process, developed in the thickness of the cylinder wall with a non-uniform thickness.

The break occurred near the welding, known as thermal influence zone (the analyzed cylinder being welded longitudinally).

The research has shown that inter-crystalline corrosion associated with pitting (punctiform) corrosion developed between the dendrite branches leads to an intense metal degradation in the wall depth and, in limited cases, causes perforation of the metal wall, increasing the explosive fracture development.

A factor that influenced the corrosion process in the ZIT area was the mounting of the compressed air cylinder with the welded area at the bottom of the landmark.

P. 33 The influence of vacuum degassing on improving the quality of ship's steels

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Abstract: In this paper, the authors chose to study the non-alloy steel grade S235JR, developed in the LD (Lintz-Donawitz) converter from Arcelor Mittal Galati plant, considering the quality and purity improving of the produced steel as a main objective.
The correlation of mechanical properties with steel purity, as a result of the liquid steel processing in three methods to the continuous casting machine (CC) was followed.
In the first method, the final chemical analysis of the liquid steel from CC was taken at the end of the insufflation, without desulphurisation and degassing.
In the 2nd method, the final chemical analysis of the liquid steel from CC was taken after the desulphurisation and chemical and thermal homogenization in the Ladle Furnace (LF) installations.
In the 3rd method, the final chemical analysis of the liquid steel from CC was taken after the vacuum degassing, i.e after the treatment in the Ruhrstahl Heraeus (RH) installations.
The RH process is an effective vacuum treatment processes, being used both for degassing and decreasing the content of non-metallic inclusions and for decarburization (in low carbon steels manufacturing process) and even for the chemical composition and casting temperature steel control in tight limits.
In all three methods, the samples are reported to close in with the non-alloy steel grade S235JR prescriptions, but the highest values of the mechanical tests were obtained for the series with the lowest levels of non-metallic inclusions, corresponding to the finest grain, with the largest real grains (method 3).
The research has shown that vacuuming in RH led to: increasing the purity due to degassing, reducing the H_2, O_2 and N_2 content by vacuum de-oxidation; decreasing the content of non-metallic inclusions; the possibility of steels manufacturing with tight limits in the chemical composition; vacuum carburizing of steel.

P. 34 Structural analysis of thin Ni-P layers

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Abstract: The structure of the Ni-P layers obtained by electroless method depends on both the phosphorus content and the working parameters used in making such layers. The deposition mechanism by autocatalytic reduction method is a chemical one which does not lead to structures as shown in the Ni-P balance diagram. In the experiments of the present work, Ni-P layers were made of thin steel strip with low carbon content. Thin 2-7μm layers to immersion durations of 5, 10 and 15 minutes were obtained.The chemical composition of the layers was determined by energy dispersive analysis (EDS) and X-ray diffraction. By optical microscopy and scanning electron microscopy by (SEM) it was analyzed the appearance and surface morphology of the deposited layers depending on the content of phosphorus and working parameters (temperature, pH, stirring speed). The layer structure was analyzed in cross section and the layer break. The analysis results show that thin coatings of Ni-P have a surface topography that follows faithfully the steel support. Depending on the content of phosphorus , on the layer surface of low phosphorus content spherical particles of different sizes can be seen while high and average phosphorus content coatings feature a smooth surface with nanometer-sized grains. Analysis of the cut-off /break section of the Ni-P layer structure , show a more or less porous structure depending on the stirring speed and pH. Layers adhesion was assessed microscopically also by Erichsen test that shows different behaviors depending on the plastic deformation of the phosphorus content and the layer thickness.

P. 35 Obtaining and characterizing the Zn-Fe coatings

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Abstract: The protection Zn-Fe layers are recommended for the following qualities: a better weldability than the zinc-coated plates, very good capacities for painting and lacquering, wear resistance, good adherence, lower zinc consumption

The steel samples coated with Zn-Fe alloy were obtained by two procedures: electrodepositing and heating the zinc-coated plate with the Fe diffusion into the protection layer.The zinc-coated plate was heated to 550-650 OC exposing it for 1-3 minutes, when Zn- Fe alloy layers of 11-22% Fe was obtained.

Paper show the corrosion resistance of these coatings as compared with the zinc-plated steels, the corrosion resistance is a basic criterion for the assessment of a metal coating. The corrosion

resistance of the samples was tested by two procedures: the test in salty spray and the electrochemical method. For Zn Fe alloys coatings obtained by heating the Zn-coated plates an improved corrosion resistance is found when the amount of Fe is increased along with a higher corrosion resistance as compared with the zinc-coated plates.
In the case of electrolytic depositions, where the layer thickness is lower than in the previous cases, the corrosion resistance decreases for amounts of Fe higher than 20%; as a whole the corrosion resistance is still higher than that of the heat Zn coated plates.

P. 36 Considerations on titanium-based alloys used in metal-ceramic restorations

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Abstract: The requirements for obtaining ceramic restorative prosthetic works at a quality standard means ensuring specific technical and technological conditions, the primary purpose being to achieve a strong chemical bond between metal and ceramics. In this context, the use of suitable alloys and the corrosion of the thermal expansion coefficients of the alloy and ceramics still make important goals of current research, and titanium alloys for metal-ceramic restorations are insufficiently studied from this point of view.
The paper presents a part of the results of some researches performed to illustrate the behavior of titanium alloys, the way of assessing the resistance of the metal-ceramic bond and determining the nature of this bond.

P. 37 Evolution and characteristics of titanium alloys used in oral implantology

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Comment: Discovered in 1791 by William Gregor and isolated from its ores in 1939 by the Kroll process, titanium was originally used as pure metal. Of all its properties, the most useful features of titanium are the corrosion resistance and the high ratio of hardness to specific weight. Non-alloy titanium is used in implantology with a purity of about 99.75% and an iron content of max. 0.5% (usually less than 0.1%).
The Ti-6Al-4V alloy, commonly used for implants, has a combination of the most favorable features (very good mechanical properties and corrosion resistance), the first to produce titanium dental implants were Linkow (1968) Branemark (1969) and Hofmann (1985), which uses this alloy.

The need to remove some harmful chemical elements in known titanium alloys has led to the investigation of Ti-Al-Nb or Ti-Zr-Al alloys that have demonstrated (eg Ti-6Al-6Nb alloy) in addition to mechanical resistance and corrosion comparable to Ti-6Al-4V alloy, a decrease in the release of proinflammatory and osteolytic mediators that are responsible for the loss of prostheses.
In today's modern approaches titanium-zirconium alloys are revolutionary materials whose proven characteristics are increased mechanical strength (50% higher than pure titanium), very good and fast osteointegration, reliability and safety, especially for low diameter implants. The paper summarizes the results of research on the characteristics of Ti-Zr alloys for oral implantology.

P. 38 Risk assessment and workplace conformity audit, blast-furnace worker, C.S. ARCELOR MITTAL GALATI

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Abstract: Risk assessment is the first step towards safer and healthier jobs, is the way to reduce accidents at work and occupational diseases. Taking into consideration the need for good management of the risks of accident and professional disease at the unit level and the new legal requirements, the evaluation of the risk factors for injury and professional illness at the – blast-furnace worker- from C S ArcelorMittal Galati.

P. 39 Studies on the heat recovery from the aglomeration machine no. 2, S.C. ARCELORMITTAL GALATI

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Abstract: Heat recovery to the sinter plant is a means of improving the efficiency of the sintering process. The hot agglomerate must be cooled down. The heat recovered from the sinter cooler is used to preheat the combustion air for burners in the ignition furnace. In addition to heat recovery, the system helps decreases and particulate emissions, and improves sinter productivity, yield and cold resistance. This makes a recirculated type system more efficient than a non-recirculated type.

P. 40 Wastewater treatment. Case Study - SEAU BRAILA

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Abstract: The paper analyses the influent and effluent parameters, as well as the efficiency of the purification process. CBO5 is found to be within the legal limits in terms of the amount of effluent suspensions of max 6.0 mg / l O2. The efficiency of their removal from the influent was at least 94.8 %. CCO is observed within the legal limits of the amount of effluent suspensions of max 20.2 mg / l O2. The efficiency of their removal from the influent was at least 93.0 %. Suspended matter shows that the effluent sludge was within the legal limits of max 10.9 mg / l, and the efficiency of their removal from the influent was at least 91.6 %. Total nitrogen (Not) and total phosphorus (Pt) are exceedances of the limits for sensitive areas subject to eutrophication. A downstream denitrification step is proposed downstream of the aerobic stage to eliminate total nitrogen, and a phase of chemical treatment or alternation of aerobic and anoxic steps is proposed for the removal of total phosphorus.

P. 41 Studies on biodegradable solid waste treatment

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Abstract: The research aimed at collecting waste on organic fractions and non-biodegradable waste. This method of separation provides good quality products for heavy metal and plastic contamination. Segregation of waste allows it to be treated, recovered, reused, or eliminated economically and ecologically. Fresh waste mixed with ~ 30% inoculum. Waste has a humidity of ~ 70-80%. Reduction of volatile matter during digestion indicates the performance of the system. The results show that the methane potential increases rapidly after 30 days and stabilizes to 50 days. The rate of biogas production in the digester decreases with the increase in the volatile content and is due to the limited capacity of the digester to homogenize the content well. The process is improved by raising the temperature from the mesophilic condition to 2 ° C per day, reaching the thermophilic condition of 55 ° C. Increasing the rate of charge has led to a decrease in biogas production.

P. 42 Tensile behaviour of glass fiber reinforced resins after having undergone thermal fatigue cycles

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Abstract: The tests were conducted to an ambient temperature of 25 ° C on the INSTRON mechanical test machine and aimed at determining the mechanical properties of the materials subjected to traction stresses.
In the case of hard materials, it is noted that for all the elasticity and breakage materials coincides, the value of the tensile stress at the elastic limit has the same value as the unitary tensile stress.

P. 43 Polarization curves for E36, A and ARMOXT440 steel using Prohension Test

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Abstract: The E36, A amd ARMOX T440 steel was corroded using Prohension test. This Mild steel is widely used in various industrial processes such as acid pickling, industrial cleaning, acid descaling, oil-well acidizing, shipbuilding and petrochemical processes.
The corrosion was investigated by weight loss test, potentiodynamic polarization, optical microscope and scanning electron microscopy (SEM). The results for ARMOX T440 showed The more positive value for desorption onset potential or desorption peak potential means that the better stability of the adsorption process will occur in corrosive medium.

P. 44 Quantitative image analysis in some iron powder metallurgy materials using computer vision technique

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The goal of the present paper is to analyze the porosity in some powder metallurgy (P/M) alloys by two different methods, by using the conventional method and by image processing analysis method. Quantitative image processing is a new and useful tool which is able to determine the pore size, pore size distribution and porosity of parts obtained by P/M route. One important and

significant disadvantage of P/M processing is the presence of porosity due to their activity as crack initiators and, due to their presence as the stress distribution in compacts is nonhomogeneous in the cross-section. Two atomized iron powders obtained by powder metallurgy with particles of different sizes (< 45, 45-63, 63-100, 100-150, >150 μm) are the based materials studied in this paper. The analyzed powders were subjected to uniaxial pressing with 600 MPa as the applied pressure. The compacts disc dimensions obtained are $\phi 8 \times 6$ mm in dimensions. The compacts were sintered in a laboratory furnace at a temperature of 1.150 °C. The sintering time was 60 minutes. The sintered specimens obtained were analyzed regarding their porosity, density and microstructure. Porosity of iron-based powder metallurgy materials was measured using computer vision technique. A correlation between the experimental and software data analysis could be established.

P. 45 Bearing failure prediction using audio signal analysis based on SVM algorithms

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Abstract: Bearings are machine elements used in a wide variety of applications including transportation. The accurate prediction of a bearing failure is important to sensitive applications to secure its safety during the service life. Bearing failure prediction is useful both in bearing testing phase as well as in case of lifetime use. Real-time Audio signal analysis and advanced algorithms are able to identify the incipient failure, caused by defects, fatigue, overload or poor maintenance. Audio signal analysis and processing remains a domain where technique and algorithm needs to be developed. In this paper is presented a proof-of-concept technique and equipment developed to predict failure of bearings in case of testing phase. For this study, acoustic emission signals were measured and analyzed during life testing of bearing while other sound source are also recorded. Correlation between the acoustic emission patterns were identified in order to identify noise signal and identify the signal associated with bearing degradation. The developed solution to isolate other sounds signals means that the technique could be used while lifetime of the bearings. The results of this study provide evidence that accurate estimation of the failure of various bearings is possible by processing the vibration signal acquired from a single point, even in case of multiple sound sources are present and introduce noise in signal processing. The SVM classifier provides at least 80% mean accuracy. The influence of model on prediction accuracy has also been discussed in the work.

P. 46 Image processing technique for paint defect identification

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Abstract: Nowadays Automatic inspection based on computer vision are used in a wide area of applications in industry. This paper proposes a new computer vision system for automatic inspection of painted steel sheets in order to identify defects using macroscopic analysis. In

automotive industries the quality assesments is of utmost importance and is performed by human operators and consequently this process is insufficient and costly. The analysis quality is dependent on operator skills. Consequently, automatic paint defect inspection offers important advantages such as low cost and quality. The proposed system analyzes the images acquired to identify different kinds of defects. OpenCV library is used for image processing operations and the holonic algorithm developed in this work assures a image defects identification. The holonic algorithm allows fast image processing, though low level operations concerning image processing are performed with OpenCV library. The algorithm can be used as online though the video stream provides huge amount of data to be processed in order to achieve a reliable result.The developed vision system consists of the i) physical implementation of video acquisition and ii)the development of an image processing algorithm that is able to identify the visual defects present on painted surface. The identification of defects using image processing proved to be very challenging as we aimed to detect defects in environments with variation of illumination as well as in case of depth non-uniformities.

P. 47 Design of casting technology for the "wheel"

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Abstract: It is presented a study on the selection of the type of carrots and the optimization of the casting technology using simulation and design software

P. 48 Considerations on using of photovoltaic panels with flexible polymer semiconductor cells

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Abstract. This paper presents the research undertaken by the authors to determine the parameters of electric power produced by a photovoltaic panel using flexible semiconductor polymer cells, aiming a comparative study between this panel and other types of conventional photovoltaic panels, with monocrystalline, polycrystalline and amorphous silicon, based on technical and economic indicators, established under uncertainty conditions.

P. 49 Advanced systems for controlling the heat treatment electrical furnaces

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Abstract. This paper presents a modern electric heating heat treatment which has implemented an electric furnace control system through thermoregulatory with PID control laws. An important aspect is the development of a mathematical model for controlling electrical heating systems for heat thermal treatments based on mathematical modelling to predict the mechanical properties and structure of the play resulting from heat treatment. Validation of the experimental research of heat treatment temperature, designed by the mathematical model for predicting mechanical properties and structure of the finished part and model for controlling electrical heating system based on PID adjustment algorithms consists in structural analysis to determine the chemical composition, structural analysis by light microscopy, electron microscopy SEM and EDX quantitative analysis, determination of hardness alloys and physical and mechanical of the components of a plasma torch on hydrogen made of heat-treated steel.

P. 50 Comparative Study of Vibration-Absorbing Materials to Improve the Comfort of the Crew on a River Ship

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Abstract The purpose of this paper is to find a damping material for the vibrations generated by the equipment of a ship to improve the working and resting conditions of seafaring personnel on a pusher boat that travels over long distances. The experiments were made upstream the Danube. The convoy was made up of a self-propelled vessel and four barges. The water flow rate was 0.76 m/s and there were good visibility conditions and light wind. The accelerations transmitted to man were measured with Seat PAD 01dB triaxial accelerometers mounted on the floor of the ship and connected to the NetdB-Complex system for analysis and measurement. The working frequencies were 0÷100 Hz. Subjects were placed directly on the ship's deck, then on neoprene and rigid foam. It was found that for longitudinal vibrations, the r.m.s. accelerations are 9 times

higher than standard if there is no attenuator, 4.8 times higher than standard for neoprene and 2.4 times higher for rigid foam. For transverse vibrations, r.m.s. accelerations are 10.8 times higher than standard when there is no attenuator, 6.4 times higher for neoprene and 2.7 times higher for rigid foam. For vertical vibrations, r.m.s accelerations are 5.9 times higher than standard if there is no attenuator, 3.4 times higher for neoprene and 1.7 times higher for rigid foam. For transmissibility determining, the results are also similar. It was shown the importance of a vibration attenuator for the health, comfort and implicitly for labour productivity of river sailing personnel.

Keywords: vibrations, attenuating materials, ship, Danube

P. 51 CVD deposition of thin films of Fe, Cr and Ni oxides on glazed ceramic substrate

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Abstract: By using as a target an austenitic stainless steel alloy disk mounted in a magnetron sputtering gun (dc magnetron sputtering), in Ar medium and water vapor, it was obtained thin film combinations of oxides. Strong, adherent, semi-transparent coatings, colored in shades of brownish to gray-metallized, have been investigated in terms of composition, optical characteristics and electrical characteristics.

P. 52 Testing methodology of composite materials, studying the wear behavior of the types of polymers and their properties.

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Abstract: Demands for performing materials are growing and wider, so no material can satisfy it. This natural way of increasing demand has led to the revival of a concept, combining different materials into an integral composite material to meet user requirements.
The performance of a composite material is typically expressed through its various properties, and they depend on the properties of the components, the nature of the relationship between the components and the spreading method. This research, based on the analysis of a considerable number of studies conducted in this direction and on the study of some fundamental works of the field, aims at the analysis of the shock behavior of composite materials made of different resins. By designing the research, we first focused on the formation and analysis of the shock behavior of materials with the same type of polymeric matrix (epoxy resin). The paper also shows the experimental results obtained by bending loading by using the method of the three points.

Theoretical results are compared with the experimental results concerning to the force-displacement curves corresponding to the linear portion of the loading curve. Finally, the errors are computed and their possible causes are explained.

P. 53 Mechanical behavior of mixed composite materials between epoxy resins with epoxy-novolac modified vinilesteric resin

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Abstract: This paper presents theoretical aspects and experimental results of mechanical tests of composite materials formed in the Mechanical Engineering Laboratory of the "Dunarea de Jos" University of Galati. This paper focuses mainly on the formation of composite materials obtained from the mixture of: Epiphenic epoxy resins, epoxy resins type C and HT in a proportion of 5%, 10%, 15%, 20% of the epoxy-novolac modified vinyl ester resin. Then proceed with the treatment of the composites formed and the extraction of the specimens to determine the characteristics describing the mechanical behavior as well as the experimental study on the three-point bending test with the Instron 8802 Mechanical Testing Machine.
Bending tests are used to determine flexural strength, flexural modulus, or other dimensions resulting from the stress-strain analysis under the condition that the specimen is supported on two supports and the loading is performed midway between the two supports (bending in three points).
Finally, the preliminary results of the mechanical tests are presented. Several aspects were pursued in the studies: determination of the method of formation and design of the modified composite materials, elaboration of the methods of choice of the chemical substances and of the necessary quantities, determination of the matrix and methods of testing the mechanical properties, morphological view of composite materials formed.

P. 54 Determination of correlation between the composition, rolling parameters and mechanical characteristics of the hot rolled steels

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Abstract: The controlled lamination of thick sheets involves the use of algorithms for choosing the rolling parameters: the initial heating temperature, the lamination scheme (the distribution of the total thickness reduction on each rolling cage, the number of passes through each cage and the distribution of the thickness reduction on each passage, intermediate cooling - cooling time and speed), and the temperature of the product obtained at the end of the rolling. The complexity of the phenomena, which occur during the hot plastic deformation process and which must be

sufficiently well mastered in order to obtain reproducibly the technical specifications imposed on the products with different destinations, is the justification for this work. The data provided by Arcelor-Mittal Galati was used to obtain the mathematical model. Equations that correlate the main mechanical characteristics with the chemical composition of the steel and the parameters of the hot rolling pattern used are presented.

P. 55 Graphene post-processing

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Abstract: Graphene is a two dimensional wonder material, used for electronic and medical applications. To date, various synthesis method of graphene layers are proposed, such as: SiC epitaxial growth, Chemical Vapor Deposition (CVD) and mechanical exfoliation. Graphene single layer can be rapidly produced by CVD. Although the transfer process on different substrates has been researched, a post processing step after graphene growth has not been studied to understand the graphene properties. Deposition of graphene on metal transition substrate involves many reactions, and is not clear what happens with the unreacted methane. The scanning electron microscopy is the best method to visualize this unreacted species as a thin film which covers the graphene layer. The post processing of graphene after CVD is a crucial step for the performance of graphene-based devices.
The graphene film is characterized morphologically and structurally before and after the post-processing step, with the scope of removing the unreacted film and investigating the influence of this step on the graphene properties. To identify the specific vibration of graphene layer before and after post-processing step, Raman spectroscopy has been used. Here, we investigate the quality of CVD graphene before and after removing unreacted hydrocarbon, to better understand the importance of post-processing process for device applications, before the graphene transfer.

P. 56 Magnetoelastic properties in polycrystalline Fe-Pd based ferromagnetic shape memory alloys

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Abstract: Ferromagnetic shape memory alloys (FSMA) have attained strong interest over the last years and Fe-Pd based alloys are more suited for engineering and medical applications, due to their improved ductility and biocompatibility [1] compared to the well-known Ni2MnGa alloy. The shape memory effect in disordered Fe–Pd (30 at.% Pd) is associated with f.c.c.–f.c.t. thermoelastic martensitic transformation (MT). The melt–spinning technique removes the precipitation of undesirable b.c.t. irreversible phase [2] and the addition of a third alloying element may promote the stabilization of the f.c.t. martensite.
The present work reports the effect of Mn substitution for Fe on the magnetic, magneto- elastic and MT properties of the Fe69Pd30Mn1 and Fe67Pd30Mn3 "as prepared" and thermally treated ribbons. The samples were investigated by X-ray diffraction, calorimetric, magnetic and magnetostrictive measurements. Linking the structural, magnetic and magnetostrictive analysis on as prepared ribbons and those subjected to different subsequent thermal treatments, highlights the role of substitution and of heat treatment of MT. The temperature dependence of the linear thermal expansion of samples in static magnetic fields provide information on the easy axis of the magnetization in the martensitic structure.
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P. 57 Effect of Cr, C, B and Mo substitutions on the structure and magnetic properties of Zr-Co Rare-Earth-free magnetic alloy

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Abstract: Getting new permanent magnets without Rare-Earth is a new challenge in the field of magnetic materials. Co-rich Co-Zr alloy seems to be a solution to be pursued.
The microalloying effects of different elements on the structure and stabilization of hard magnetic Zr2Co11 phase of Zr-Co alloy have been analysed. It was shown that the Zr2Co11 non-cubic high anisotropy structure can be stabilized in ZrCo alloy by the partial substitution of Co with elements with high atomic radius [1]. Therefore we made substitutions of up to 5% of alloying elements like Mo, C, B, Cr to nucleate and stabilize the nano-hard magnetic phase. The structural and magnetic properties of new Zr18Co77Cr3X2 (X = C, B, Mo) prepared bulk alloys have been analysed and related to those of Zr13Co87.

[1] S. Xu et al_W.J. Cond. Matt. Phys. 2 (2012) 197

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