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Unconventional Methods of Thermomechanical Treatment of Tool Steel

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Tool steels are traditional materials whose heat treatment routes are well-established. Despite that fact, unconventional treatment methods can be used, for instance for refining chromium carbides and general strengthening of the structure. One of the methods that considerably alter microstructure is semi-solid processing. By means of passing through the semi-solid state, the X210Cr12 steel (ČSN 19436) developed a microstructure of polyhedral austenite grains embedded in a carbide network. Forming of this material at an appropriate temperature led to recrystallization of the austenitic microstructure and to uniform distribution of carbides with a size of approximately 2 µm. By varying the rate of subsequent cooling, microstructures ranging from austenite to martensite could be obtained.

Keywords: semi-solid state, tool steel, dynamic recrystallization, metastable austenite

Acknowledgement

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References


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The Study of Defects on Galvanically Plated Polymeric Parts

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Galvanic plating of polymeric structural parts is widely used in many industrial branches, e.g. in automotive. Minor errors in their manufacturing process are responsible for presence of surface defects. These defects, especially in the case of visual and decorative parts, are unacceptable. This paper demonstrates the usage of optical and electron microscopy to reveal and solve common problems in industrial production. Different types of galvanic plating defects on injection molded parts made of ABS, PC/ABS and PA manifest themselves by different ways.

Keywords: Microscopy, Coating, Analysis, Defect, Polymer

Acknowledgement

The results of this project LO1201 were obtained with through the financial support of the Ministry of Education, Youth and Sports in the framework of the targeted support of the “National Programme for Sustainability I” and the OPR&D project Centre for Nanomaterials, Advanced Technologies and Innovation CZ.1.05/2.1.00/01.0005.

References


Tribological Properties of TiN/AlTiN and AlTiN/TiN Nanomultilayer Coatings

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The paper presents the research results of the various coatings deposited using the cathodic arc evaporation Physical Vapour Deposition (PVD) method at 300°C, suitable for application on temperature-sensitive steel substrates. Three main groups of coatings are deposited, denoted as E1, E2 and E3. The deposited bi-layer numbers for E2, E3 and E4 are 103, 207 and 107, respectively. Each group consists of two subgroups, TiN/AlTiN and AlTiN/TiN as NML or superlattice coatings are deposited onto high-speed steel substrates using pure titanium and aluminium-titanium (70/30 at. %) cathodes. Tribological testing is conducted using an Al₂O₃ ball and a ball made from steel ISO 683/13, and the applied load and path length at the used speed of 60 RPM are 10N and 25m, respectively. Measurements are performed at room temperature and a humidity of 44 ± 2%.

Keywords: Cathodic Arc Evaporation, Nanomultilayer, Wear Rate, Friction Coefficient, Surface Coating Morphology

Acknowledgement

The paper was supported in part by the project LO1201 through the financial support of the Ministry of Education, Youth and Sports in the framework of the targeted support of the “National Programme for Sustainability I” and the OPR&D project “Centre for Nanomaterials, Advanced Technologies and Innovation” registration number CZ.1.05/2.1.00/01.0005.

References


There are a large number of special methods for exploring the internal condition of materials on the basis of eddy currents. A major use of this method can be seen in surface engineering, particularly in studying some state quantities of surface integrity. It is also an irreplaceable tool in surface engineering. The reason is that no other affordable method provides information on both the surface and the sub-surface regions, as the latter are difficult to reach by most other inspection methods. It must be noted that the sub-surface region is significant, and dictates, to a large extent, the behaviour of the overlying surface. This article explores a non-traditional application of eddy current inspection. This inspection technique is typically used for detecting discontinuities in material. The study presented here involves a use of this non-destructive testing method for studying work hardening in two metallic materials: EN AW-1090 aluminium alloy, and S235JR-C carbon steel.

Keywords: eddy currents, work hardening

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References


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Novel Porous Ti-Based Alloys for Implants with Enhanced Bioactivity

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Porous titanium implants are increasingly used for excellent corrosion resistance, mechanical properties similar to bone, biocompatibility and good osseointegration ability. The advantages of porous structure are lower density which causes better ingrowth of bone tissue. Changing the porosity influences resulting mechanical properties. Higher porosity decreases the elasticity modulus and tensile strength. Newly developed alloys based on titanium and silicon can be used as bone fillers, artificial interverbal discs, augmentations or dental implants. Titanium and silicon are nontoxic elements for human body, which is very important for biocompatibility. Another advantage of these alloys is that they have an ability to spontaneously create porous structures without pore forming agent. Pores support implant ingrowth. Varying the concentration of silicon influences the porosity of the alloys prepared by reactive sintering. The best mechanical properties were achieved in the case of alloys with 2-7 wt. % of silicon.

Keywords: Titanium implants, porous titanium, mechanical treatment, bioactivity.

Acknowledgement

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References


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Influence of the Degreaser Type on the Bonded Joint Strength

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In the report the results of bonded joints laboratory tests are published. The determination of the tensile lap-shear strength of rigid-to-rigid bonded assemblies according to the standard CSN EN 1465 (66 8510) was the aim of the carried out tests. The samples were made from steel sheets. For bonding of test samples four different types of adhesives were used (two super glue adhesives, one epoxy adhesive and one contact adhesive). Ahead of bonding the surfaces of all samples were blasted using corundum grit and degreased. For degreasing four various types of five different degreasers were used, namely perchlorethylene, acetone, methanol, technical gasoline and toluene. Then the samples were dried using warm air. For comparison the blasted samples without degreasing were bonded, too. At the tested samples bonding the consumption of adhesive was determined. From the adhesive consumption for one bonded joint and from the adhesive price the costs of one sample bonding were calculated. After curing the bonded assemblies were loaded using the universal test machine LabTest 5.50 ST up to their rupture. The rupture force was written down. From the values of the rupture force and the bonded surface size the bonded joint strength was calculated. By the carried out tests evaluation the influence of different degreaser types was determined. Also for all used adhesives the price of one bonded joint was calculated.

Keywords: adhesive bonding, degreasing, technological properties of adhesives, testing of bonded joints

References


Microstructure of Twin-roll Cast Al-Mg-Sc-Zr Alloy

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A model twin-roll cast Al-Mg-Sc-Zr alloy was prepared and the evolution of microstructure during a step-by-step isochronal annealing was characterized by electron microscopy and light optical microscopy. Inhomogeneous structure with significantly finer grains in the middle of the strip is generated by casting. Subsequent annealing up to 550 °C does not alter this grain-size mainly due to the presence of a fine dispersion of Al₃(Sc,Zr) particles, which forms at annealing temperatures below 300 °C. Although these particles coarsen and partially transform at higher annealing temperatures their strengths as recrystallization inhibitors is sufficient to prevent the increase of grain size up to 550 °C. Nevertheless, the beneficial contribution of fine precipitates to microhardness is fully suppressed by the annealing at high temperatures.

Keywords: Al-Mg-Sc-Zr, Twin-Roll Casting, Microstructure

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References


Reduction of Sink Marks in Injection Overmolding Process of Metal-Plastic Parts

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Metal-plastic parts with steel inserts prepared by overmolding technique showed several molding defects including sink marks. The depths of sink marks on overmolding metal-plastic parts prepared at two injection overmolding temperatures of 280 and 230 °C and the same packing pressure of 60 MPa were measured by contact profilometer. They reached the depths of 3.02 mm and 1.51 mm at the overmolding temperature of 280 and 230 °C respectively. These values were correlated with sink marks indexes simulated in Moldflow software at the same conditions. Based on the simulated and measured results the optimal process parameters with injection temperature of 200 °C and packing pressure of 25 MPa were proposed. Simulation showed a positive effect of optimized parameters on sink marks minimizations. Sink marks indexes decreased of 20 % and 53 % compared to injection molding temperatures of 230 and 280 °C respectively. Maximal depth of sinks marks decreased to the value of 1.00 mm at optimized injection overmolding process parameters.

Keywords: metal-plastic part, overmolding, sink mark, simulation, residual stress

Acknowledgement

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References


Handling Simulation of Vehicles

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The article describes the vehicle passability testing possibilities by the help of computational simulation with the usage of computing simulation system ADAMS AVT. The simulation calculations can help to find quick answers to basic and additional questions of design change influences in the area of testing vehicle passability. The first part of the article contents description of partial computation simulation models construction which the calculations are associated with. The binding conditions of calculations are mentioned also. In the second part of the article, there are mentioned and evaluated the results of performed simulation calculations. These calculations are performed in order to find out an influence of operation conditions on the vehicle passability. Real operation condition is invasive vehicle speed into a slope in this case. Under investigation is the change of the gradient angle uphill maximum and beaten distance uphill that is the vehicle able to overcome.

Keywords: simulation, computational modeling

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References


Simulation of Spinneret Micro-hole Spade Drill Drilling Based on DEFORM-3D

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An emulation study of the drilling by the spade drill on the spinneret micro-hole is conducted by using FEM analysis software DEFORM-3D. According to application of finite element software DEFORM-3D, some characteristic parameter of the work piece and the cutting tool material are set. The distributed situation of cutting force, cutting temperature and tool wear in different cutting parameters are simulated analysis. By discussing the location of the spade drill drilling wear, further optimization of parameters cutting and tool for the spinneret micro-hole drilling provide the better basis.

Keywords: Deform-3D, Spade Drill, Spinneret Micro-hole, Cutting force, cutting temperature, Tool wear

References


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Preparation of Ti-Al-Si Alloys by Powder Metallurgy

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Ti-Al-Si alloys are very prospective materials for many applications, particularly for automotive and aerospace industry, due to their low density, excellent resistivity to oxidation and heat stability. The main problem is high brittleness at room temperature and high mechanical characteristics persisting only up to 800 °C, which is limiting in some applications. Ti-Al-Si alloys were prepared by powder metallurgy using Self-propagating High-temperature Synthesis (SHS), which is considered as a first step in production consisting of SHS, milling and consolidation by Spark Plasma Sintering. In this experiment the observed subject was the microstructure and phase composition of Ti-Al-Si alloys in order to find optimum alloy composition for desired technology. Based on the results of this work, TiAl15Si15 alloy can be recommended due to fine microstructure composed of titanium silicide (Ti5Si3) particles in the matrix of titanium aluminide (TiAl). Concerning the production by SHS, the highest achievable heating rate can be recommended.

Keywords: Intermetallics, Powder Metallurgy, Reactive Sintering

Acknowledgement
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References
Influence of Thermodynamic Phenomena at the Optimum Cutting Parameters when Grinding

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In particular, the quantitative and qualitative results of the technological process are in most cases determined by the level of finishing operations, which include in particular grinding. It is characterized by high precision, the accuracy of geometric shape and generally very good quality surface. One of the factors to achieve the desired quality of finished surfaces, in particular, knowledge of the effect of temperature of the contact surface of the grinding wheel and the ground. In the article is the methodology of the quantification of the impact of cutting parameters on the temperature of the grinding. Another requirement is the right choice of other cutting parameters, to guarantee the achievement of the required accuracy dimensions and shape, increase performance and decrease the temperature of the contact of the cut surface with a grinding wheel.

The result is the desired surface integrity and the exclusion of undesirable residual stress in the lustre of the surface. In the case of the quantification of the individual characteristics of the grinding on the optimization of the grinding process, it is possible to achieve this objective.

Keywords: energy characteristics of the grinding, cutting, grinding the surface integrity parameters, residual voltage, quantification of heat and temperature

References


Qualitative Evaluations of the AlSi7Mg0.3 Microstructure by the X-Ray Diffractometry

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Nowadays it’s very important to minimalize the costs of casted parts, what obviously conclude to reduction in time that is necessary for the heat treatment. Despite this fact it’s necessary to keep or moreover increase mechanical properties like a strength, ductility, toughness and dimensional stability. Better mechanical properties lead to the better material utilisation, this parameter is represented by the following formula: \[ Q = R_m + k \log A_s \], known as a Quality index and increase of this parameter conclude to weight reduction of casted part. For obtaining good quality of the casted part it’s very important to watch the cast´s internal composition, hence the microstructure of the casted part. For the facts mentioned above, this paper deals with evaluation of the microstructure of aluminium alloy AlSi7Mg0.3 by an X-ray diffractometry using the Debye-Scherrer method with configuration for rebound reflection and comparison of the results with metallographic observations using the light microscopy. Work is showing the opportunities of the X-ray diffraction for the nondestructive material testing of the casted aluminium parts, because in this field there are not enough knowledge about the comparison and evaluation between the microstructure and diffraction. Great advantage of the X-ray diffraction is that the testing surface doesn’t needs to be specially treaded. This technology is non-destructive for the surface analyses so for the testing of the internal material composition it’s necessary etching.

Keywords: AlSi7Mg0.3, X-ray, diffractometry, microstructure, evaluation

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References


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A Multi-Directional Magnetic Treatment Approach to Improve the Dimensional Stability of Bearing Rings

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Comparing with one directional magnetic treatment, a multidirectional magnetic treatment is applied to reduce residual stress in thin-walled bearing rings in order to improve the dimensional stability of bearing rings. The magnetic field was applied in both the axial and the radial directions of the thin walled bearing rings respectively. Six months of repeated testing results demonstrated that the dimension of bearing rings after magnetic treatment had no significant change. Experimental results shows both the major axis(the longer axis of an ellipse)and the minor axis(the shorter axis of an ellipse)appear shorten tendency and the dimension of bearing rings tends to be stable. Thin-walled uniform radial pressure deformation formulas are applied to calculate the reduced stress, and the maximum reduction is up to 45.97MPa. Research shows the multi-directional magnetic treatment can improve the dimensional stability of bearing rings and used in practical engineering.

Keywords: Multidirectional magnetic treatment, Residual stress, Dimensional stability

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Here and now, I would like to extend my sincere thanks to all those who have helped me make this thesis possible and better. Firstly, I am deeply grateful to my honorable supervisor Qingsheng Xie, who have checked through my thesis with patience and given me instructive suggestions, and he also played an important role in indicating a bright road in my future writing. Then thanks to the teachers and professors who have taught me over the past three years of study. Finally, I am very grateful to my lovely friends and classmates who have offered me quiet situation to compose my thesis and discussed with me about my thesis.

References


A Study on Rebound Characteristic of Sealing Ring Used in Solid Rocket Motor

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Solid Rocket Motor (SRM) is a key component for the missile and space rocket. Sealing performance is an important index for SRM assembled. It is a necessary condition for study on the sealing performance of SRM to determine the residual stress of sealing ring which is difficult to be obtained by direct detection in engineering practice. This paper derives the quantitative expression of the relationship between residual stress, pressure difference and preload stress and establishes the method of determining residual stress of sealing ring by mechanical analysis. With the help of experiment, verify the correctness and applicability for expression meanwhile, analyze the influence of SRM’s types and rubber sealing ring materials on residual stress changed under the effect of pressure difference. Therefore, the method of residual stress determined provides theoretical support to improve the SRM assembly process and lays a foundation for later study on the leakage rate of SRM.

Keywords: Solid rocket motor, Rubber sealing ring, Rebound characteristic, Residual stress

Acknowledgement

The authors acknowledge the support from Chinese Equipment Manufacturing Unit and the Rockwell Automation of Chongqing University during the course of this study.

References


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Statistical Monitoring of Decrease of Surface Eccentricity and Hole of Barrel Tubes from High Strength Steels under the Production Conditions

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This work investigates issues of BTA drilling of deep holes with slenderness ratio \( L: D = 45÷60 \) of high strength steels with a tensile strength of \( R_m = 1350÷1600 \) MPa. Methodology for testing of surface when turning and boring deep holes after drilling accordingly, heat treatment, straightening annealing and stress relief, was based on the statistical monitoring of eccentricity surface deviation from the theoretical axis of the bore axis for instruments with changeable carbide cutting inserts with CVD/PVD coatings under operating conditions with the number of 30 pieces. Measurement results of eccentricity of surfaces for locating strips before and after machining (as in turning and drilling for more cuts) are statistically processed in tables and graphs, as well as the obtained and acquired results. Article presents the optimized parameters of BTA drilling. Originally used tools for drilling were upgraded by using carbide inserts of type 14.171.55 -00/0400 or /0250 by Krupp WIDIA. Influences of factors are discussed, and the monitoring of factors that produce holes of desired eccentricity is presented.

Keywords: Barrel Tube, BTA System, Deep Hole Drilling, Surface Eccentricity, Statistical Monitoring

Acknowledgement

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References


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Investigation of Thrust Force and Delamination during Drilling of C/PPS

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Drill bits used for machining of composite materials can have different geometries and it is difficult to choose suitable geometry for a specific type of composite. Unsuitable geometry of a drill bit leads to bad surface quality. The objective of this paper is to find the most suitable drill bit geometry for machining of the thermoplastic composite C/PPS in terms of surface quality and magnitude of thrust force under different cutting conditions. Three drill bits were chosen for experimental investigation. A significant influence of the point angle was identified. A gradually decreased point angle together with an increased rake angle of the cutting edge lead to better surface quality. In addition, investigation of the influence of cutting conditions on surface quality and cutting forces was performed. A considerable influence of feed was observed in comparison to cutting velocity. Information included in this paper can help to design more suitable technology for drilling of thermoplastic composites.

Keywords: FRTC drilling, Drilling tools, Delamination, Cutting forces

Acknowledgement

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References


Fixtures Design for Increasing of Quality Production of Cast Workpiece with Weld Deposit

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The article deals with the principles of fixtures design and their application at machining of armature DM 100, PN 25/40-RF. It is bulky component that is produced by casting technology. Surfaces near the hole of valve are hard machinable due to weld deposit. Considering elimination of clamping device weaknesses that could originate due to unsuitable design and production, it is advantageous to use a virtual model along with simulation and analysis in CAD/CAM system. Nowadays technologists have strong tools in their hands that increase efficiency of solution not only conventional, but also specific, problems. On the other hand, they have to know to solve some difficulties in their mind, such are, for example, the differences in specifications of coordinate systems used for virtual model in CAD/CAM system and coordinate systems used in real production. The problems can arise in case of cutting tool definition according to the tool-in-hand or tool-in-use systems. Based on theoretical know-how two fixtures were designed for manufacturing of two sets of surfaces that are normal each other, so after innovation manufacturing operations were realized in vertical and in horizontal position of workpiece axes. Using new approach, the production efficiency and production rate have increased twice and no failure product has been made.

Keywords: Design Principles, Jig and Fixture, Hard-Machinable Surface, Virtual Model, Cutting Tool, Coordinate System

Acknowledgment

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References


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Chip Formation Comparison- Merchant´s Model vs. Model with Rounded Cutting Edge

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Merchant's model of chips formation considers an "ideal" (sharp) cutting edge. However, nowadays many manufacturers of cutting tools modify the tool geometry with the goal to increase the tool life and to improve the surface quality. The processes, at which the modified tools are used, go along with chip formation and physical phenomena that differ from Merchant's model.

The article deals with the simulation of chip formation at various ratios of rounded cutting edge and cutting thickness. Aim of the research has been focused on the interpretation of new knowledge from the cutting theory. Authors have tried to understand the theory of cutting process by means of simulation and provide the recommendations for practical usage. They explain the differences between the Merchant's model with a sharp edge and a model with a rounded cutting edge. The contribution describes changes and manifestations of physical phenomena result from given conditions. There were also simulated dependencies of the tool load on the radius of cutting edge in the article. Achieved results will enable not only better integration of cutting tools into the manufacturing, but they also allow to increase the machining efficiency.

Keywords: Cutting Edge, Merchant’S Model, Simulation, Chip Formation

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References


Optimization Machining of Titanium Alloy Ti-6Al-4V by WEDM with Emphasis on the Quality of the Machined Surface

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The objective of this work is to assess cutting speed during the wire electrical discharge machining (WEDM) depending on the machine parameters setting (gap voltage, pulse on time, pulse off time, wire speed and discharge current) and follow-up assessment of the surface quality achieved. In order to achieve efficient machining the maximum cutting speed is required, however maintaining of the required quality and functional characteristics of the machined surface must be considered. Surface morphology during the wire electrical discharge machining is formed by a high number of craters, of which depth has direct effect on area parameters and profile parameters of the surface quality. These parameters were evaluated using Contactless 3D profile-meter based on the principle of coherence correlation inter-ferometry IFM G4 from the Alicona producer.

Keywords: WEDM, Electrical Discharge Machining, Design of Experiment, surface roughness, titanium alloy

Acknowledgement
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References


The Influence of Laser Beam on the Surface Integrity of Cutting Edge

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The presented scientific article deals with cutting edges after cutting by laser beam. The article describes the characteristics of the laser beam the factors entering into the process of cutting by CO\textsubscript{2} laser, and their interaction on the integrity of the cutting edge of selected technical materials - steel S23JR. The article includes experimental evaluation of the interaction of input factors and parameters on experimental samples with thickness \(t = 2\) mm which were cut by applying different parameters for the accurate assessment of the impact for each selected technological parameters. The experimental part of this article deals with changes of speed laser cutting and cutting speed influence on HAZ width and hardness of cutting edges. The outcomes of this article may be the prediction and parameters settings recommended for laser cutting as regards of HAZ width and hardness of cutting edge.

**Keywords:** laser cutting, cutting parameters, cutting edge

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**References**


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Mechanical Properties of Co-Cr-Mo Alloy in Dependence in the Composition and Production

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The aim of this work was studying the effect of the composition and production on mechanical and tribological properties of cobalt alloys. Co-Cr-Mo alloy began to be used for manufacturing dental implants, but nowadays they are successfully used for the production of orthopaedic implants thanks to better wear resistance than is offered by titanium implants. However, there is still ongoing effort to even more improve the wear resistance and other properties of cobalt based alloy. The aim of this research was to find a suitable combination between composition and production, which would increase the wear resistance, keeping the other mechanical properties at least at the same level. Standard Co-Cr-Mo alloy and also Co-Cr-Mo alloy with various alloying elements, specifically Nb, Ti in an amount 5 wt%, were prepared by casting and also mechanical alloying followed by compacting method "Spark Plasma Sintering". The influence of production route as well as influence of alloying elements on the microstructure, mechanical and tribological properties were observed. Based on the obtained results, the Co-Cr-Mo-Ti alloy production by casting seems to be most suitable, because the addition of titanium has greatly improved the wear resistance. However, it is necessary to perform many other tests, especially tests of corrosion resistance and biocompatibility.

Keywords: cobalt alloy, mechanical properties, biomaterial, type of production, wear resistance

Acknowledgement

This research was financially supported by Czech Science Foundation, project No. P108/12/G043.

References


Application of Powder Metallurgy in Production of Biomaterials

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Metallic biomaterials are currently produced mainly by conventional metallurgical processes, i.e. the melting and casting used e.g. in production of cobalt alloy implants, or forming processes as cold or hot working (rolling or forging of stainless steel for surgical applications). Such processes including melting are used also in production of “smart” biomaterials – NiTi shape memory alloys. The mechanical properties are strongly dependent on the grain size. Therefore, the techniques to obtain finer structure are very desirable to enhance the mechanical properties of the biomaterials and thus to increase lifetime of the implant. This paper is devoted to the description of the possibilities of powder metallurgy not only for the structure refinement, but also for the production of clean biomedical alloys as well as the porous biomaterials. The use of powder metallurgy is described for Co-Cr-Mo surgical alloy, Ni-Ti shape memory alloy and Ti-based porous biomaterial. In addition to known methods, new powder metallurgy processes and materials developed by the authors are presented.

Keywords: powder metallurgy, biomaterials, microstructure, properties

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References

Measurement Precision KUKA Robots Move at a Defined Distance and Proposal for a Robotized Workplace to Support the Learning Process

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This article describes robotised welding workplace and gathering information from the workplace. It focuses on the collection of information to wear welding pliers. The workplace will be linked to a database, which will dispose of the measured data, which we will be able to through the web server we can look on the Internet, anywhere in the world. The advent of the Internet has significantly changed the environment of the production and education. The implementation of Web technology moves to integrate into production systems virtual races. With this rapid information technology we can exchange data on production and products all over the world 24 hours a day, and regardless of the place and time. The Internet allows for effective cooperation and interaction at a distance on a global scale. Through the internet it is possible to provide the operating instructions without physical presence of the production systems. The Internet not only allows quick access to its ability, but also their rapid transfer. Local production and regional trade is becoming global. The relationships between suppliers, producers, consumers, which have so far been "personal" to become virtual. Through the Internet, you can run the activities of the production system, inform all interested parties about what is happening and what has happened.

Keywords: poccmax, poczmax, kkz

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References


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High Entropy Alloys Prepared by Combination of Mechanical Alloying and Spark Plasma Sintering

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High entropy alloys belong to quite novel materials that are attracting far more attention throughout the entire materials research. They are characterized by wide range of unique properties e.g. ultra-high strength while maintaining its ductility, good corrosion resistance, wear resistance, thermal stability, magnetic properties and many others. Generally, they are composed at least by five elements with nearly equiatomic compositions that are further characterized by high mixing entropy allowing only formation of solid solutions. The investigated CoCrFeNiMn high entropy alloy was prepared by powder metallurgy processes combining the mechanical alloying with high-tech compaction via spark plasma sintering. The microstructure of prepared compact alloy was examined by the optical microscopy and electron scanning microscopy with EDS detector. The chemical and phase composition was determined by the results of the XRF analysis and by X-ray diffraction analysis. Prepared alloy reached ultra-high compressive yield strength of 1570 MPa and hardness 352 HV 30 outperforming the cast alloy with identical chemical composition that reached only 230 MPa and 120 HV 30, respectively.

Keywords: Mechanical alloying; microstructure; hardness; high entropy alloys.

Acknowledgement

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References


Influence of the Friction Time on the Shape and Microstructure of the Mixing Zone of the Friction Welded Joint

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An analysis of the friction time influence on creation and structure of the mixing zone during the friction welding process of the two dissimilar steels is presented in this paper. The changes were monitored on the two welded samples, made of the highly-alloyed steel HS 6-5-2-5 and the high carbon C60 steel. The objective of this work was to show how the mixing zone is created and to point to its influence on the quality of the whole welded joint, since it is characterized by the inhomogeneity of the microstructure and the chemical composition. Those problems arise due to the thermal and deformation conditions, so during the experiment the welding pressure (70-90 MPa) and the welding time (3-18 s) variations were monitored. Experimental results have shown that the shape and the structure of the friction zone are strongly dependent on the friction time and that by its variation one can obtain the desired structure and thus the quality of the friction welded joint. Based on obtained results the minimum value for the friction time is recommended.

Keywords: Friction time, mixing zone, dissimilar steels, microstructure, welded joint quality

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References


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Changes in Microstructure and Properties of Ni-Ti Alloy after Addition of Ternary Alloying Element

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In this work, the influence of alloying element in equimolar Ni-Ti alloy was investigated. Selected alloying elements (cobalt, chromium, niobium) were added into Ni-Ti46 wt. % powder mixture. The samples were prepared by self-propagating high-temperature synthesis at temperature of 1100 °C with the use of high heating rate (300 °C/min). The changes in microstructure, phase composition, temperature of reaction between Ni-Ti-X powders, phase transformation temperatures and mechanical properties were studied.

Keywords: Intermetallics, Ni-Ti-X alloy, shape memory, powder metallurgy, self-propagating high-temperature synthesis.

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References


Construction of Mechanic Regulation of Turbine Ventilator using Half-Flap

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An article deals with a definition, concept, development, calculation and construction of a prototype solution of a mechanical regulation of a turbine ventilator using a half-flap eliminating an amount of ventilated air. The whole mechanic regulation solution lies in a central shaft. When a rotation nozzle is spun to high revolutions, a flap closes gradually and eliminates air flowing. This prototype of the mechanical regulation may be used for classic concepts of turbine ventilators, where the rotation nozzle stays in one position and only rotates around its own axis.

The article describes individual development stages from the concept up to construction, including a final visualization of the prototype solution of the mechanical regulation of the turbine ventilator using the half-flap. The mentioned innovative solution of the mechanical regulation is very up-to-date thanks to its simplicity and non-service operation. It is just the matter of time when one of the producers would be interested in the turbine ventilator solution and it would be introduced into a market space.

Keywords: Turbine Ventilator, Mechanical regulation, Half-flap, Drained Air, Flap, Suction Capacity

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References


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Effects of Grit Blasting on Surface Properties of Adhesive Bonded Adherents

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A mechanical treatment of an adherent before an application of adhesives is one of key factors influencing resultant strength of an adhesive bond. A grit blasting belongs among one of the most often used methods of the surface treatment. A resultant structure of blasted adherent and also parameters of the surface roughness can be changed during the blasting by a suitable choice of many parameters among which a material and a size of abrasive particles, a distance of an air jet and a blasted material, a size of the jet, an air pressure and an angle of abrasive particles impact can be ranked. This experiment describes an injector system of grit blasting using basic abrasives – corundum and glass ballotini. During grit blasting of common steel adherent it came to the change of the impact angle of the abrasive particle in a range from 75° (a perpendicular angle) to 10°. Different impact angle led to different roughness parameters and to various structure of the adherent surface which was evaluated by an electron microscopy. Subsequently, it came to experimental description of the strength of adhesive bonds which were created by adherents whose surface was grit blasted under various impact angles of abrasive particles.

Keywords: Ballotini, corundum, erosive wear, lap-shear strength.

Acknowledgement

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References


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Physical and Metallurgical Views on the Process of Chip Creation

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To understand the process of chip creation during machining requires knowing the behaviour of metal at high degrees of mechanical and thermal stress which occurs in microvolumes of machined material. During machining the chip is characterized by unique deformation structure which does not occur with other methods of mechanical metal machining. This is the reason why its explanation is rather complex. The implementation of the knowledge of mechanical and thermal stress which occurs in microvolumes of machined material. During machining the chip is characterized by unique deformation structure which does not occur with other methods of mechanical metal machining. This is the reason why its explanation is rather complex. The implementation of the knowledge of metal physics in confrontation with the experiment can finally contribute to the optimization of the process of metal machining and the selection of optimal cutting conditions.

Keywords: cutting, chip formation, cutting forces, stress

References


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Structural Damping of Mechanical Vibration

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Mechanical vibration is undesirable in the majority of cases. It can have a negative influence on accuracy of manufacture, service life of processing equipment and tools, labour protection, human health and so on. Excessive noise belongs to the accompanying phenomena of the mechanical vibration too. For these reasons it is necessary to eliminate mechanical vibration in an appropriate manner. There are different possibilities of vibration damping. Application of suitable materials with damping effects belongs to these possibilities. This paper is focused on structural damping of materials. Damping properties of different materials were experimentally measured and subsequently evaluated by means of the forced oscillation method. It was found that the vibration damping depends not only on the material type but also on material density and thickness, excitation frequency and mass load.

Keywords: Forced Oscillation, Transfer Damping Function, Frequency, Thickness, Inertia Mass.

References


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Use of Optical and Electron Microscopy in Evaluating Optimization by Material-Technological Modelling of Manufacturing Processes Involving Cooling of Forgings

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From the technological viewpoint, the manufacture of forged parts is a very complex process governed by countless interrelated factors, the most important of which include temperature profiles, and magnitude and velocity of deformation. For a forge shop, a well-established and optimized forging process guarantees sound profit. Given the changing demands of the market, the range of products and the associated manufacturing parameters must be updated frequently and rapidly. In most cases, this means production line stoppages and production capacity losses due to new process development and optimization. Using material-technological modelling, it can be carried out in laboratory conditions instead, without interfering with the production. In this paper, several optimization experiments based on material-technological modelling are evaluated using various optical and electron microscopy methods.

Keywords: Material-technological modelling, cooling optimization, image analysis, scanning electron microscopy

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References


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Numerical Control Simulation and Experimental Study on End Milling Ordinary Cycloidal Gear in Five-axis CNC Machine Tool

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A machining method of end milling cycloidal gear using ball end mill is proposed based on the analysis of grinding and side milling ordinary cycloid gear. The machining principle of end milling cycloid gear using 5-axis CNC milling machine is analyzed and the geometric model of end milling cycloidal gear is established. At the same time the NC simulation of the machining process is conducted. End milling ordinary cycloid gear is conducted using five-axis machining center and it verifies the feasibility and scientific of end milling ordinary cycloidal gear. The machining precision of the cycloid gear is measured using a three coordinate measuring machine, and it verifies the reliability and usefulness of the machining method. It proves that the machining method can achieve grinding precision. Using end milling instead of grinding cycloid gear is achieved in order to improve the machining efficiency.

Keywords: ordinary cycloid gear; end milling; five-axis CNC machining; measuring accuracy

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References


Optimization of Lasers Parameters for Marking Cylindrical Shanks from SC and Cermet

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Industrial laser marking of the parts is used for the long life identification. For these the micro engraving and annealing are used. The main requirements for the marking are visibility, readability, stability and especially surface without surface modification or defects. In case of the cutting tools main marking are made on the cutting tool shank so it is necessary to use the correct parameters of the marking setup. The marking must be made without change of accuracy and surface quality. When the bad parameters are used the sharp edges are created on the edge of the descriptions. These edges cause gradually damage of the clamping surface and it causes gradually loss of clamping accuracy. So it is a very important to use optimal parameters which depend on the marking material.

These article deal with process optimization of the laser marking parameters when the sintered carbide and cermet are used. The laser parameters like laser power, scanning speed and frequency were change and surface quality change of accuracy and surface quality. When the bad parameters are used the sharp edges are created on the shank so it is necessary to use the correct parameters of the marking setup. The marking must be made without face without surface modification or defects. In case of the cutting tools main marking are made on the cutting tool.

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Keywords: Laser marking, sintered carbide, cermet, surface quality

References


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Research on Integrated Optimization Design Method for Diesel Engine Valve Train

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In order to have a good performance of gas exchange in working process, a function of six order polynomial dynamic cam was established in this paper. The influence of the maximum ample factor to valve including the maximum positive and negative accelerations and the minimum curvature radius was analyzed by NLPQL. On this basis, multi-body dynamic analysis for diesel engine valve train was done, valve train dynamic model was established in this paper. The influence of the maximum ample factor to valve including the maximum positive and negative accelerations and the minimum curvature radius was analyzed by NLPQL. On this basis, multi-body dynamic analysis for diesel engine valve train was done, valve train dynamic model was established in this paper. ISIGHT software was used to optimization and calculation. Finally, a set of different cam parameters and corresponding valve performance parameters was established, multipart integrated design and multidisciplinary optimization for diesel engine valve train was realized. This paper provides a new method for the multicomponent integration design and multidisciplinary integration optimization for diesel engine valve train.

Keywords: Multidisciplinary Optimization; Valve Train; Cam Profile; Ample Factor

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References


Evaluation of Properties from the Cutting Surface after Applying Laser Beam Technology Using Different Scales of Cutting Speed

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This article is focused on the processing of steel materials by thermal cutting technologies - laser cutting. It analyzes the impact of technological parameters - cutting speed effect on the cutting surface quality. The goal is to define the parameters ensuring proper amount of heat absorbed into the material that does not affect the cutting surface to avoid difficulties during further processing - such as drilling, thread cutting etc. To determine the effect of cutting speed on the quality of the cutting surface, it was necessary to measure an internal stress and a hardness of HVM. Internal stresses in the experimental part of the article were measured by the X-ray diffraction and the resulting values are shown in the graphs. In the article are also shown microstructures of selected samples after the laser cutting under the different cutting parameters.

Keywords: laser cutting, heat affected zone, properties of cutting surface, hardness of cutting surface

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References


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