ABSTRACTS

Edyta Andrysewicz, Joanna Mystkowska, Jan Ryszard Dąbrowski, Ewa Och, Katarzyna Skolimowska, Marcin Klekotka
The Influence of Saliva and Its Substitutes on Corrosion of Some Implant Alloys

The purpose of this paper is evaluation of the influence of human saliva and its substitutes on the corrosion resistance of some implant alloys used in stomatology, which included: austenitic steel (316L), titanium alloy (Ti6Al4V), and cobalt alloy (CoCrMo). Corrosion studies were conducted by means of the potentiodynamic method with the application of the VoltaLab 21 kit with VoltaMaster 4 software. The reference electrode was a saturated calomel electrode (SCE), whereas the counter electrode was a platinum electrode. The results of conducted studies indicate an increased current density in the passive range on potentiodynamic curves of studied alloys in the environment of human saliva, and also in a commercial saliva solution – Mucinox. On the basis of conducted corrosion studies, it can be stated that in terms of corrosion resistance the developed saliva substitutes may constitute competitive solutions to commercial saliva substitutes. The prepared substitutes should be studied further from the perspective of practical application for patients. The original value of the paper is a proposition of new saliva substitutes.

Ľuboš Kaščák, Emil Spišák, Ivan Gajdoš
Joining the Combination of AHSS Steel and HSLA Steel by Resistance Spot Welding

The paper deals with the optimization of parameters of resistance spot welding and quality analysis of welded joints made by combination of galvanized Advanced High Strength Steel and High Strength Low Alloy steel. It is an advanced material combination utilized in automotive industry to reduce weight of the vehicle body and consequently lowering the fuel consumption to achieve the lowest possible fuel consumption, high active and passive safety of passengers while decreasing the amount of emission. The quality of welded joints was evaluated by destructive tests and non-destructive tests. The shear tensile test according to STN 05 1122 standard was used. Some samples were prepared for metallographic analysis, where the influence of the welding parameters on the structure of welded joint and occurrence of pores in the weld metal caused by evaporation of zinc from the coating was observed.

Ľuboš Kaščák, Emil Spišák, Jacek Mucha
Clinchrivet as an Alternative Method to Resistance Spot Welding

Various materials are used in car body production which are not always possible to join by conventional joining methods such as resistance spot welding. Therefore ClinchRivet method seem to be possible alternative. The paper deals with evaluation of properties of the joints made by mechanical joining method – ClinchRivet. The joint is made with the using of a special rivet, which is pushed into the joined materials by the flat punch. Following materials were used for joining of this method: DX51D+Z and H220PD steel sheets. The tensile test for observing the carrying capacities and metallographicall analysis were used for the evaluation of joint properties. Some results of the tests of ClinchRivet joints were compared to the properties of the joints made by resistance spot welding.

Tomasz Kubiak, Zbigniew Kołakowski
Thin-Walled Epoxy-Glass Fibre Beams Subjected to Pure Bending

Buckling and postbuckling behaviour of thin-walled channel section beam made of epoxy-glass composite have been considered. The beams under analysis was subjected to pure bending. The main aim was check the influence of ply arrangement on buckling load and postbuckling behaviour and validate the authors analytical-numerical method by commercial finite element method software. Mentioned analytical-numerical method has been developed for more than 25 years in Department of Strength of Materials. This method uses asymptotic Koiter theory for conservative systems in the second order approximation modified by Byskov and Hutchinson. Additionally, using the finite element method software the influence of ply arrangement on failure load were checked.

Jerzy Madej, Bartłomiej Będkowski
Air Flow Analisis for Electrical Motor's Cooling System with Autodesk Simulation CFD 2013 Program

In the article the analysis of airflow through electrical motor was conducted and optimal design solution was chosen in order to increase cooling efficiency. Numerical simulations allow to determine the areas of temperature occurrence which may have destructive influence on electrical motor parts and on its safe operation. The numerical calculations of airflow was carried out for two different types of fans as well as for two different housings. An analysis of the construction was carried out by CFD method using Autodesk Simulation CFD 2013. Community results of the analysis, we can conclude that the better solution for machines with fixed direction of rotation is to use instead of the radial the axial fan. For axial fan the motor temperature in the same condition was lower by about 5°C.

Stanisław Mroziński, Michał Piotrowski
Influence of Temperature and Loading Program on the Fatigue Life of Steel P91

In this paper there are shown the results of low-cycle fatigue testing of steel P91 samples. During the testing there was conducted a fixed amplitude loading testing as well as programmed loading with various sequence degrees of the program. The testing was done in two temperatures: T=20□C and T=600ºC. During the testing a cyclic steel weakening was observed without a clear period of stabilization. Greater changes of the cyclic properties were observed in temperature T=600ºC. The influence of temperature on the fatigue life was determined in this paper. This influence is dependent on the degree of strain. It's a minor one in the range of big strain and increases in the process of decreasing the degree of strain. Furthermore, the impact of the loading program type was determined on the test results and fatigue life calculations.

Michał Petaś, Krzysztof Mróz, Krzysztof Doliński
Damage Modeling in Graded Layer System

The simplified approach to the modelling of low cycle fatigue (LCF) of functionally graded materials (FGM) based on the continuum mechanics is presented. The fatigue damage model takes into account the mechanical part of the load and a constant service temperature. The concept of FGM as a particle-reinforced metal-matrix composite with gradual change of the reinforcement fraction is used. The FGM is considered as a material consisting of homogeneous layers containing different volume fractions of the reinforcement. The variation of the reinforcement fraction changes the material properties for each layer. The different material properties are obtained according to modified rule of mixture. Since the fatigue damage of metal matrix composites is strongly influenced by the inelastic deformation of the metallic matrix, the constitutive equations of LCF damage model are taken into consideration. The combined isotropic/kinematic hardening model with linear behaviour of isotropic and kinematic parts of hardening is adopted. The damage scalar parameter is associated with the plastic energy dissipation which is used to update the material properties. The fatigue damage model presented in this paper is applied to the fatigue damage analysis of the cooling channel of thruster used in space shuttles and rockets.

Bogdan Sapiński, Wojciech Horak
Rheological Properties of MR Fluids Recommended for Use in Shock Absorbers

The paper summarises the results of laboratory testing of rheological behaviour of (magnetorheological) MR fluids designed for use in shock absorber and vibration dampers. The experiments used a rotational rheometer with an extra chamber inside which a uni-form magnetic field can be generated. Underlying the description of rheological properties of fluids is the Herschel-Bulkley's model of viscous-plastic substances. The aim of the experiment was to determine the shear stress, yield stress, the yield factor and the power-law exponent depending on the magnetic flux density, followed by the comparative study of rheological parameters of investigated fluids.

Bogdan Sapiński, Wojciech Horak,Marcin Szczęch
Investigation of MR Fluid in the Oscillatory Squeeze Mode

The paper summarises the results of laboratory testing of three commercially available magnetorheological (MR) fluids operated in the oscillatory squeeze mode. Tested fluids include the Basonetic 204 and Basonetic 4035 (BASF) and MRF-122EG (Lord Corporation). The oscillatory squeeze mode produces large forces at small displacements. This feature may be well utilised in fabrication of new MR devices. The purpose of the experiments was to evaluate the suitability of MR fluids for applications in MR vibration dampers being developed under the current research project. The results enable a comparative analysis of investigated fluids and verification of phenomena encountered in the oscillatory squeeze mode and reported in the literature.

Ján Slota, Miroslav Jurčišin, Ivan Gajdoš, Emil Spišák
The Sensitivity of a Photogrammetric Method in Formability Analysis

Nowadays is a possible to implement numerical simulation and photogrammetric inspection to the complex process chain of inspection. In the recent years there has been significant progress in accuracy improving of these methods of inspection in pre-production or post-production stage of manufacturing. This article discusses these two methods from sensitivity and comparison point of view. Most attention has been paid to the photogrammetric method and his sensitivity to using different approaches. Results were compared with the result of numerical simulation and experiment. Numerical simulation was performed in static implicit finite element code Autoform. For this purpose, GPS cover of galvanized steel of DQ category was used for inspection. In this paper was proved that photogrammetric method of strain measurement is highly sensitive on the various external factors. Further results and findings are included in the next chapters of this paper.