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ABSTRACT

MATERIALS SCIENCE

HIGH STRENGTH STEELS FOR SAFETY APPLICATIONS IN AUTOMOTIVE INDUSTRY

Daniel IACOB, Alina Adriana MINEA, Paulo Nobre Balbis REIS

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Key words: High strength steels; Impact strength; Life Cycle Assessment.

Abstract: In automotive industry high strength steels are applied in order to obtain a significant weight reduction and high impact strength. The aim of this paper is to establish an overview about a new high strength steel generation in terms of impact response, economic and environmental impacts all over the product life cycle. This paper characterized a new high strength steel, DOCOL 1400 electrogalvanized, in terms of impact behaviour. The impact energy, maximum force, damage size and elastic recuperation were obtained. Comparing the results with similar ones presented in literature it is possible to conclude that higher yield stress promote better impact performances. The effect of damages was also studied. The position of the defects presents a significant influence and when positioned in the rolling direction can stop the crack. It is possible to conclude that these materials promote significant increases in terms of impact strength, cost/benefit and a significant thickness reduction.

CORROSION OF GALVANIZED STEEL REINFORCEMENTS IN ELECTROLITES THAT STIMULATE THE INTERSTITIAL SOLUTION IN CONCRETE PORES

Andreea HEGYI, Vasile RUS, Claudiu BUMBUC, Horațiu VERMEȘAN

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Key words: concrete, hot-dip galvanized steel reinforcement, corrosion.

Abstract: This paper presents the results of a study regarding the corrosion mechanism of galvanized steel reinforcements in solutions that stimulate the interstitial solution in the concrete pores, with different pH values, with or without the influence of chlorine ions. The results obtained through electrochemical impedance spectroscopy have proven that hot-dip galvanized steel has the best corrosion durability. The activation of the zinc surface immediately after its contact with the electrolyte and the formation of the rough, compact, adherent protective layer of calcium hydroxyzincate occurred in a time interval influenced by the pH of the electrolyte and the existence or non-existence of chloride ions.

STUDY ON VISCOSITY PROPERTY OF Zr₅₀Cu₅₀ METALLIC GLASS-FORMING LIQUID

Lijun CAO, Jingsong WANG, Wei SUN, Haoyan SUN, Jinghua WANG, Qingguo XUE

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Key words: Zr₅₀Cu₅₀, Metallic glass-forming liquid, Viscosity.

Abstract: A method, covering slag technology combining rotating cylinder method, was proposed in this paper for measuring the viscosity of the metallic glass-forming liquid, and the viscosity of Zr₅₀Cu₅₀ metallic glass-forming liquid was measured. The experimental results showed that in the temperature range of 1383K to 1208K, the relationship of viscosity and temperature can not be described by a uniform Arrhenius equation. Two discontinuous points on the curve of $\ln\eta - 1/T$ have been found. After analyzing the changes of viscous activation energy E_v , the microstructure of molten alloy could be changed. The viscosity of Zr₅₀Cu₅₀ metallic glass-forming liquid is three orders of magnitude higher than that of some other alloys, this property is closely related with the excellent GFA of Zr₅₀Cu₅₀ alloy.

THE INFLUENCE OF METAL QUALITY ON FATIGUE STRENGTH

Traian BOLFA

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Key words: crystalline network, fatigue, cracks, cavities.

Abstract: The setting of the parameters that condition the operating safety and the determination of life duration are analyzed according to the behavior of the operating structure and not depending on the tensions calculated with the classical relations of materials' strength, or depending on the mechanical properties obtained through conventional static tests. Materials' fatigue is an essential criterion in choosing the materials and sizing the structures.

MICROHARDNESS STUDY AND TRIBOLOGICAL BEHAVIOR OF MULTIPLE LAYERS OBTAINED BY ELECTRODEPOSITION

Bogdan FLOREA, Raul NOVAC, Elisabeta VASILESCU

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Key words: composite covering, electrodeposition, multilayers.

Abstract: The paper presents some results obtained following an extensive experimental research program on the application of technology for the composites by electrodeposition. Single layers were deposited also double and triple layers into a matrix of copper and nickel using copper as a support. Results are presented and analyzed in the variation of the microhardness and tribological behavior of deposited layers.

ANALYTICAL METHOD FOR FLOW PATTERN IN MULTI-STRAND TUNDISH

Mingmei ZHU, Guanghua WEN, Ping TANG, Yuanqing CHEN

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Key words: multi-strand tundish, combined RTD curve, mean residence time, flow pattern, dead volume.

Abstract: The dead volume fraction of the fluid in the multi-strand tundish can not be analyzed accurately when adopted the common method. Accordingly the whole flow pattern can

not be expressed accurately. In order to solve the problem, the concept of the combined RTD curve for the multi-strand tundish is presented, and it is applied to the modified combined model, and the analysis method of the combined RTD curve for the fluid in multi-strand tundish is formed. The piston flow, mixed flow and dead zone volume fraction can be calculated by the method. A new explanation for the mean residence time of multi-strand tundish is also clarified. The method has been used to analyze the flow pattern of a six-strand tundish.

STUDIES AND RESEARCHES ON QUALITY IMPROVEMENT OF CONTINUOUSLY CAST BILLETS UNALLOYED AND LOW ALLOYED STEELS

Ilie BUTNARIU, Dumitru ANGELESCU, Dănuț FLORESCU

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Key words: continuous casting, defects, measures.

Abstract: This paper presents the results of industrial researches in the reduction of specific defects in continuous casting billets. It established the main factors that influence technological billets contribute to improving the quality of continuously cast and mechanical characteristics.

REQUIREMENTS IN SERVICE IMPOSED TO MATERIALS FOR FRICTION COUPLINGS

Ilie BUTNARIU, Antoniu CERNĂIANU, Dumitru ANGELESCU

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Key words: anti-layer characteristics, influencing factors, classification.

Abstract: The paper presents the main characteristics required antifriction materials used in friction couplings and technological factors contributing to these requirements. It also presents the criteria for choosing the bearing material.

SUB-ZERO TREATMENT ON CASE HSS STEELS. Part 1. STRUCTURE AND MICROSTRUCTURE STUDY

Vasile BULANCEA, Diana Antonia GHEORGHIU

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Key words: structure, microstructure, conventional heat treatment CHT, cold treatment CT, shallow cryogenic treatment SCT, deep cryogenic treatment DCT.

Abstract: In order to improve the physical-mechanical characteristics of the machine-parts and cutting and plastic deformation tools, the effect of heat treatments at sub-zero temperatures is resorted to. A distinction is made between the shallow/surface cryogenic cooling (SCT) and the deep cryogenic cooling (DCT). At the same time, the cyclographs of the heat treatment variants and the treatment temperatures are presented. The structure and microstructure of the treated steels, as well as the hypotheses concerning the microstructure mechanisms acting during the cryogenic cooling are studied.

SUB-ZERO TREATMENTS ON CASE HSS STEELS. STRENGTH PROPERTY ESTIMATE

Vasile BULANCEA, Diana Antonia GHEORGHIU, Dragos ACHITEI

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Key words: Sub-zero treatments, Austenite, Martensite, Carbides, Hardness, Wear, Dimensional stability.

Abstract: The specialized literature considers that the cryogenic treatment improves the wear resistance. That is why it was applied to numerous types of steels and tools. Even if the results are not consequent, this work tries by means of the performed studies, to propose a point of view concerning the increase of the wear resistance with the contribution of the cryogenic treatment. Investigations were carried out on the AISI M1 and SEW320 S3-3-2 steels concerning the part payed by martensite, fine dispersed carbides separated through cryogeny, the stress condition induced by cryogeny, the wear resistance and dimensional stability, in increasing the tools durability.

EFFECTS OF CATALYSTS ON THE COMBUSTION BEHAVIOR OF PULVERIZED COAL INJECTION (PCI) ANTHRACITE AND ITS MECHANISM

Chong ZOU, Liangying WEN, Shengfu ZHANG, Chenguang BAI, Guibao QIU, Xuewei LÜ, Xiuqin TAN

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Key words: anthracite, pulverized coal injection, catalyzed combustion, combustion behavior, thermal analysis.

Abstract: Effects of three typical metallic oxides including Fe_2O_3 , La_2O_3 and CaO on combustion behavior of the pulverized coal injection (PCI) anthracite are investigated using the thermogravimetry-differential thermogravimetry (TG-DTG) and differential scanning calorimeter (DSC) under air atmosphere. The results indicate that the three additives have obvious catalytic effects on anthracite combustion reactivity and efficiency especially when temperature is over 500 °C. TGA results indicate that additives can increase flammability, improve burnout behavior, enhance anthracite combustion reactivity. DSC results indicate that the reaction: $CO + 1/2O_2 \rightarrow CO_2$ is strengthened and moved ahead to early stage with the catalysts addition, resulting in higher combustion efficiency and the larger heating effect of the whole combustion process. With CaO , Fe_2O_3 and La_2O_3 addition, the values of exothermic increased by 8.46%, 9.76% and 16.32%, respectively. Moreover, kinetic parameters of catalysts on combustion of anthracite are determined using two methods. The decreasing activation energy of the combustion stage with the catalysts addition indicates that catalysts can improve anthracite combustion behavior by enhancing the overall combustion rate. Finally, the mechanism of catalytic combustion of anthracite is proposed: CaO can promote the pyrolysis and combustion stage by electron transfer between calcium and carbon (or organic matter). The cause of catalytic effects of Fe_2O_3 on the combustion is oxygen transfer via various forms of iron oxides (FeO , Fe_3O_4 , $Fe_{1-x}O$ and Fe_2O_3). La_2O_3 can accelerate the oxygen transfer between carbon and oxygen with the help of high oxygen storage capacity.

MECHANISM OF ELECTRIC PULSE EFFECTS ON AL MELT CLUSTERS AND SOLIDIFICATION TEMPERATURE

Haoyan SUN, Jingsong WANG, Lijun CAO, Wei SUN, Qingguo XUE

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Key words: pure Al; cluster; electric pulse modification; solidification temperature.

Abstract: The mechanism of pulse electric field effecting on liquid metal clusters was analyzed by using theory of electron polarization, based on latest progress of molecular dynamics

simulation. Pulse electric field force makes electron cloud around cluster deformed so that clusters tended to be dissociated. As average binding energy properties among Al melt clusters are different, clusters having low average binding energy were remained and proportion of stable clusters was increased; average size of clusters and the size of big clusters got smaller after electric pulse treatment. Through thermodynamic analysis, pure Al nucleation undercooling increased and latent heat decreased, that is initial nucleation temperature and solidification equilibrium temperature fall on the cooling curve. Results of verification experiment on pure Al shown that initial nucleation temperature and solidification equilibrium temperature have decreased by 2.41 °C and 2.90 °C respectively after electric pulse treatment.

INTERURBAN AIR VARIABILITY IN BUCHAREST
Ioana Maria BUȚU, Mihai BUȚU

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Key words: nitrogen oxides, population comfort and health state, pollution.

Abstract: Cities developing and urban agglomeration apparition resulted in changing the environmental conditions where our children grow. Lately the monitoring of environmental factors was underlined in order to avoid the depreciation of the comfort and health state of the people. Knowing the environmental factors evolution is necessary in order to establish the prevention ways of specific diseases in polluted areas (chest discomfort, coughing, wheezing). In this study, the fundamental aspects governing the environmental behavior of nitrogen oxides were explored from 4 air quality-monitoring stations in Bucharest (Berceni, Drumul Taberei, Lacul Morii and Mihai Bravu), over an 2 year period (2006 – 2007). The above results make the proposed forecaster a powerful tool for pollution management systems.

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