ABSTRACTS OF PAPERS IN ENGLISH

EFFECT OF ARTIFICIAL AGEING ON MICROSTRUCTURE AND MECHANICAL PROPERTIES OF 319 ALUMINUM ALLOY

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Abstract

Aluminum-Silicon casting alloys have wide applications in various industries. 319 alloy is one of these alloys that is used in the manufacturing of the fuel pump body and engine cylinder head in the automotive industry. This is a heat-treatable alloy. T6 heat treatment, which produces the highest mechanical properties and T5 heat treatment, because of no need for solutionizing and quenching procedures and case of application, are the two heat treatment processes that are mostly used in this alloy.

In this research, solutionizing has been carried out at 505 C for 12 hours and ageing has been investigated at temperatures of 150, 170 and 200 C for 2, 3.5, 5, 7 and 10 hours respectively, in T6 heat treatment. Also, ageing temperatures of 190, 205 and 220 C for 2, 4, 6 and 8 hours, respectively, have been applied in T5 heat treatment. The effect of various heat treatment conditions in T5 and T6 procedures on the microstructure and mechanical properties of the 319 alloys have been investigated. Ultimate tensile strength, clongation and hardness have been evaluated in each case. The effect of heat treatment on the microstructure and intermetallic phases has been studied through metallography and scanning electron microscopy (SEM). The results indicate that the maximum tensile strength of the alloy in T6 condition is 340 Mpa and in T5 condition is 210 Mpa. The maximum hardness of the alloy has been obtained as being 135 HB in T6 heat treatment and 95 HB in the T5 process.

STUDY OF COLD ROLLING DIRECTION ON

DEVELOPMENT OF CUBIC TEXTURE IN GOSS Fe_Si SOFT MAGNETIC LAMINATIONS

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Abstract
The development of cubic texture (100)[0kl], after double stage cold rolling and heat treatment, has been studied in soft magnetic Fe-3 wt % silicon laminations with initial (110)[001] texture. Original laminations with Goss texture have been heat treated after a single stage cold roll following their initial direction of rolling to develop primary nuclei of cubic grains. The effect of a second cold roll following initial or traverse directions has been studied after the final heat treatment of the sheets. Following the results, strong cubic textures with less second stage cold rolling have been obtained in a traverse direction. Cubic textures in thicker sections were a result of traverse second stage cold rolling.

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EFFECT OF COPPER AND SOLIDIFICATION RATE ON MECHANICAL PROPERTIES Al-Si-Cu-Mg CASTING ALLOYS

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Abstract
Al-Si-Cu-Mg casting alloys, having suitable physical and mechanical properties, are extensively applied in various industries such as Military, Automotive and Aerospace. The important microstructure controlling parameters are alloying elements, cooling rate and heat treatment conditions, which effect the mechanical properties of these alloys. The purpose of this research is the study of the effect of the amount of copper (0.1% to 2.5%) on the microstructure and mechanical properties of the alloy at various solidification rates, before and after T_6 heat treatment. For this purpose, the samples were cast in the sand mould with various thicknesses (1,2,3,4 and 5cm) and with various percentages of copper. The results show that there are two opposite effects of copper on the mechanical properties of these alloys. On the one hand, formation of copper precipitations improved mechanical properties and, on the other hand, increasing porosities, due to copper, have an opposite effect on the mechanical properties. The alloy which contained 1.5% copper indicated optimum mechanical properties.

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THE EFFECTS OF MICROSTRUCTURE ON MECHANICAL PROPERTIES OF 4340 STEEL

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Abstract
Bars of 4340 steel were heat treated to produce steel with different microstructures, i.e. tempered martensite, lower bainite and ferrite-bainite microstructures. Fatigue test results showed that the fatigue limit of steel with a ferrite-martensite microstructure is greater than the fatigue limit of the other two microstructures. The greater fatigue limit of ferrite-martensite steel is related to the initiation of secondary cracks from the original crack and a slower fatigue crack propagation rate in this microstructure, due to the ductile ferrite phase. Calculation of fracture toughness from impact energy showed that ferrite-bainite steel has a greater fracture toughness than the other two microstructures.

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EFFECT OF RANDOM LOADING ON FATIGUE

LIFE OF A STRUCTURAL STEEL

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Abstract
Generally, fatigue loading conditions in most of the structures are of random nature and loading under constant strain or stress amplitude are less frequent. In this work, fatigue life of a mild steel under random loading with different stress amplitude has been studied. The obtained results indicate that by conducting rule of accumulative damage and using constant strain amplitude curves, more appropriate approach may be achieved for fatigue analysis under random loading. Also for counting the cycles, the modified rain flow method gives better results. The obtained results show that the considered assumptions in the present work conform to the experimental results.

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EFFECT OF HEAT TREATMENT ON MICROSTRUCTURE AND MECHANICAL PROPERTIES OF AZ91 ALLOY

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Abstract
Variations of microstructure and tensile mechanical properties in AZ91 Alloy (Mg-9Wt.%Al-1Wt.%Zn) have been investigated under natural (T4) and artificial ageing (T6) conditions. The temperature of artificial ageing (T6) is 165°C. Hardness and yield strength increase and elongation decreases with ageing. Also, ultimate tensile strength is increased by ageing but decreases during the initial times of T6 heat treatment (below 40h) compared with T4 conditions. The microstructure was studied by OM and SEM. Precipitation in this alloy occurs in two forms: continuous precipitates that nucleate and grow in grains and discontinuous precipitates that form in grain boundaries. During ageing, the length of continuous precipitation increases, therefore, interprecipitate distance decreases. Formation of discontinuous precipitates causes initiation and propagation cracks in grain boundaries and weakens boundaries. This is the principal reason behind ultimate strength reduction during the primary times of T6 heat treatment in comparison with the T4 condition.

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PATTERN OF THEAFLAVIN CHANGES IN IRANIAN BLACK TEA-EVALUATION OF THE CTC AND CONVENTIONAL PROCESS IN THE ROLLING OF GREEN TEA LEAVES

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Abstract
Oxidative fermentation of tea leaves as an enzymatic process plays a definite role in the quality of black tea. In the present study, the optimized time of fermentation for Iranian black tea was determined. The results obtained were discussed in terms of measured theaflavin (TF), the major pigment formed during black tea manufacture. The effect(s) of the tea quality was studied: the traditional and CTC (Cut, tear, curl as the newer method) of the tea leaves tissue disintegration were compared. Iso-butyl-methyl ketone as the solvent of choice (i.e. as mentioned in the literature) was used to extract TF and other black tea liquor content. These contents were measured using the spectrophotometric method (λ =380 nm). The results were analyzed

using nonlinear regression. The fitted equation obtained may predict the changes of chemical variables in black tea and the importance of these changes on tea quality were discussed in terms of the correlation coefficient.

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NUMERICAL ANALYSIS OF BLAST - INDUCED WAVE PROPAGATION IN ROCK MASSES CONTAINING BEDDING PLANES

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Abstract
In this research, the interaction of blast-induced stress waves with the surrounding sedimentary media containing bedding planes was investigated by the UDEC code. The stress wave resulting from the detonation of a cylindrical hole was simulated by a triangular pulse, which is the result of an overpressure equivalent of 1635 MPa. This pressure was applied to the blasthole wall as a uniform load. The reflection and transition coefficients of two media (sandstone and limestone) at both sides of the bedding plane were estimated for both elastic and plastic media behavior. The obtained numerical results were compared against analytical solutions. A good agreement between numerical and empirical results was achieved.

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MODELING OF COKE FORMATION AND ITS EFFECTS ON STYRENE MONOMER CATALYST DEACTIVATION

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Abstract
Styrene is an important industrial unsaturated aromatic monomer. Styrene monomer is used for production of polymers. The most important commercial process for production of styrene is based on catalytic dehydrogenation of ethyl benzene. The major problem in this process is the decrease of catalyst life time and catalyst deactivation. Catalyst deactivation occurs by several mechanisms. Coke formation is considered to be the most important factor in catalyst deactivation. Gasification reaction is used for catalyst regeneration. Modeling and determination of kinetic parameters and optimization of the process can improve the final conversion to styrene and postpone catalyst deactivation.

From different coke formation modeling levels, deactivation at particle level was selected in this research. In this level, four rival models for the gasification reaction and four deactivation functions for coke formation in the particle level type are developed. The 16 models obtained are the results of the coupling of these cases. Anova one-way was used for the analysis of models with SPSS software.The reference model is the model with the largest F. coefficient. Kinetic parameters are estimated from a set of experimental data. The reference model describes satisfactorily the experimental results and has the necessary and sufficient validity and reliability. The reference model was compared with the Froment model.The error was less than 0.1% in the range of experimental data. This model is easy to use and has acceptable accuracy. Catalyst coke content, rate of coke formation and gasification and net rate of coke formation are considered under various temperatures and hydrogen, steam and aromatics pressures, with respect to the run length and other variables. The results obtained in this work correspond satisfactorily with the published data.