SUMMARIES

Sińczak J., Łukaszek-Sołek A., Bednarek S., Chyła P.:

The Forging Process of Aircraft Engines Turbine Blades

Metallurgy and Foundry Engineering – Vol. 36, 2010, No. 2, pp. 83÷90

The aim of this paper was to obtain information about optimum conditions of the forging process of a blade made from high-temperature creep resisting alloy called Inconel 718. A three-dimensional rigid-plastic finite element method (FEM) of forging process of high-pressure compressor rotor's blade analysis has been performed. Various forging process variants were analysed, including isothermal conditions.

Keywords: *isothermal forging, turbine blade, numerical calculations*

Wojtaszek M., Dudek P.:

Influence of Closed-die Hot Compaction Parameters on Selected Properties of PM Al-Si-Fe-Cu Materials

Metallurgy and Foundry Engineering – Vol. 36, 2010, No. 2, pp. 91÷96

The work presents the results of investigations of the materials obtained by closed-die hot compaction of Al17Si5Fe3Cu1.1Mg0.6Zr alloy powder. The influence of temperature and punch unit pressure on the shape of samples, as well as on relative density, selected mechanical properties and microstructure of obtained products, was estimated. The beneficial parameters of hot compaction were determined.

Keywords: *aluminium alloy powder, closed-die hot compaction, density, properties, microstructure*

Kopyciński D., Dorula J.:

The Influence of Iron Powder and Disintegrated Steel Scrap Additives on the Solidification of Cast Iron

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The study proves that by introducing the iron powder and disintegrated steel scrap to low-sulphur cast iron still before the inoculation carried out with a conventional graphitising inoculant, the mechanical properties similar to those obtained during the inoculation treatment carried out on cast iron with the recommended high sulphur content are achieved. The said operation increases the number of crystallisation nuclei for dendrites of the primary austenite. In this case, the iron particles act as substrates for the nucleation of primary austenite gp due to a similar crystallographic behaviour of the regular face centered cubic lattice The more numerous are the dendrites of primary austenite, the less free space

is available in the interdendritic spaces for the formation of graphite eutectic grains, which makes the structure more refined (more eutectic grains) and the mechanical properties higher.

Keywords: *inoculation, cast iron, dendrites, structure, mechanical properties*

Piwowarski G., Krajewski W.K., Lelito J.:

Optimization of Casting Technology of the Pressure Die Cast AZ91D Mg-based Alloy

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Pressure die casting has become the next area of experimentation on virtual models in computer memory. The article presents an attempt to optimize the manufacturing process of an item made of magnesium AZ91D alloy, which was cast using the pressure technology on a machine with a hot pressing chamber. Special attention was paid to the flow velocity in individual parts of the gating system and in the mould cavity, as well as to the air evacuation from the mould cavity. The aim was to achieve a flawless casting, especially in terms of porosity.

Keywords: *pressure die casting, Mg-base cast alloys, numerical simulation, heat and mass transfer, porosity*

Szucki M., Suchy J.S., Żak P., Lelito J., Gracz B.:

Extended Free Surface Flow Model Based on the Lattice Boltzmann Approach

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The aim of this work was to extend numerical model of mould filling phenomena previously presented in [3].

Authors described some techniques for modeling single phase and free surface flows. Method, called “piston model”, for modeling influence of liquid flow on gas behavior inside the mould and also, effect of local gas pressure on movement of metal free surface, was shown. In last part of this work, results from presented model were compared with data from the commercial simulation environment FLOW-3D.

Keywords: *numerical modeling, lattice Boltzmann method, LBM, two phase flows*

Gracz B., Lelito J., Żak P., Krajewski W.K., Suchy J.S., Szucki M.:

Statistical Analysis of SiC Addition on Heterogeneous Nucleation of α-Mg Primary Phase in the AZ91/SiC Composite

Metallurgy and Foundry Engineering – Vol. 36, 2010, No. 2, pp. 123÷130

The aim of this research was to compare influence of different SiC mass fraction and different SiC particle size on the nucleation process of magnesium primary phase in AZ91/SiC composite. This paper presents experimental results using SiC particles as a reinforcement for AZ91 alloy and

their influence on both the grain size of α-Mg primary phase and dimensional homogeneity of grains of this phase. This study provides a good basis for optimizing the process of preparing the AZ91/SiC composite.

Keywords: *AZ91/SiC composite, statistical analysis, grain size distribution, SiC particle, magnesium alloy*

Żak P., Lelito J., Krajewski W.K., Suchy J.S., Gracz B., Szucki M.:

Model of Dendrite Growth in Metallic Alloys

Metallurgy and Foundry Engineering – Vol. 36, 2010, No. 2, pp. 131÷136

The aim of this study was to develop a model of dendrite growth. The model should emphasis on solute depletion around dendrite tip and its influence on dendrite growth rate. Prepared model can be used to predict dendrite growth rate in metallic alloy. It was assumed that dendrite while growing occupy a spherical envelope with radius R that consists of solid dendrite and interdendritic melt enclosed by dendrite arms. Set of differential equations that built the model can be solved with numerical methods. The solution allows determination of dendrite growth rate and alloy component distribution in the liquid adjected to the dendrite and inside the solid dendrite.

Keywords: *modelling, crystallization, dendrite growth, free growth model*