SUMMARIES

Muszka K., Majta J., Bienias Ł.:

Effect of Grain Refinement on Mechanical Properties of Microalloyed Steels

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The goal of the present work was to study the effect of grain size and strain rate on the mechanical properties of microalloyed steels. The range of the microstructures was developed and their mechanical properties were measured under quasi-static conditions. The influence of different thermomechanical parameters on grain refinement, and thus, on final mechanical behavior of these steels seems to be very important issue, because of their application as the materials with both high strength and ductility. There is a clear lack of understanding of the role of intermediate ultrafine microstructures on the mechanical response of structural steels, which is important as this is the refinement level most likely to be achieved under industrial processes.

The main scope of this research includes the development of thermomechanical treatments to produce ultra fine-grained steels with enhanced properties. These materials will be developed for the application in many industries (e.g. automotive industry, shipbuilding), and in any commercial applications where very good properties and good-quality construction materials are of paramount importance. The results of this work will allow to systematically correlate the evolution of deformation microstructure and the deformation mechanisms operating in fine-grained materials during processing. This work will also be directed towards understanding the specific strengthening mechanisms by which the plastic deformation leads to a refined grain size.

Keywords: *grain refinement, microalloyed steel, mechanical properties*

Nowak J., Rauch Ł.:

Computer Modelling of Microstructure Development during Multistage Deformation

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The objective of this paper is implementation of microstructure development equations and their inclusion in commercial finite element code of Forge2 software. The created module is used for prediction of microstructure evolution in hot metal forming process. Calculations were carried out based on multistage forging process. Inclusion of the structural model into the Finite Element Method (FEM) source codes creates possibilities to take into account microstructural features already at the designing stage of the final industrial process.

Keywords: *Finite Element Method, microstructural development, forging*

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

Effect of Deformation Degree on Properties of Forgings after Thermo-mechanical Treatment

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Utilization of thermo-mechanical treatment in forging medium-carbon alloyed steel including microaddition of titanium is presented. Results of forging tests carried out in industrial conditions with a use of a high-speed forging press in conventional cooling conditions are compared with those involving controlled forging and direct cooling after forging. Significant grain refinement accompanied by increase in tensile properties was observed. It was also concluded that deformation degree has an effect on the final mechanical properties.

Keywords: *thermo-mechanical treatment, controlled cooling, medium-carbon steels, effective strain, impression-die forging*

Kuźnia M., Magdziarz A.:

Thermal Degradation of Waste Polyolefines and Their Application in Blast-Furnace Process

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Nowadays about 60% of world production and consumption of plastics are polyolefines. They are used as packaging, in building engineering, automotive industry or electronic engineering. High calorific value and proper chemical composition of polyolefines (based on carbon and hydrogen) make them ideal for use in a wide range of applications. The polyolefines can be used as a substitute for coke in blast-furnace processes. This paper outlines thermal decomposition of PE-LD, PE-HD, PP which are used in agriculture and packaging from household. Thermogravimetry (TG) and Differential Scanning Calorimetry (DSC) were used as analytical methods.

Keywords: *blast furnace, co-combustion, thermal analysis, waste polyolefines*