

## SUMMARIES OF LECTURES

## SAŽECI PREDAVANJA

## PLENARY LECTURES

**1. F. Vodopivec, M. Jenko, J. Vojvodič - Tuma;** *Institute of Metals and Technology, Ljubljana, Slovenia*

**Stability of MC Carbide Particles Size in Creep Resisting Steels.** Theoretical analysis of the dependence microstructure creep rate. Discussion on the effects of carbide particles size and their distribution on the base of accelerated creep tests on a steel X20CrMoV121 tempered at 800 °C. Analysis of the stability of carbide particles size in terms of free energy of formation of the compound. Explanation of the different effect of VC and NbC particles on the resistance to accelerated creep rate.

**2. O. Golovko, I. Mamuzić\*, O. Grydin;** *National Metallurgical Academy of Ukraine, Dnepropetrovsk, Ukraine, \*Faculty of Metallurgy University of Zagreb, Sisak, Croatia*

**Method for Pocket Die Design on the Basis of Numerical Investigations of Aluminium Extrusion Process.** The paper considers dependences of metal forming characteristics on dimensionless geometrical parameters of flat pocket die design at direct extrusion of aluminium thin-walled solid profiles. The theoretical analysis of plastic metal flow is carried out by means of the 2-D FEM model. The new method for flat pocket die design is proposed in the paper. The die design example is given for non-symmetrical U-shape profile.

**3. E. Mihok, P. Demeter, D. Baricová, K. Seilerová;** *Faculty of Metallurgy Technical University of Košice, Košice, Slovakia*

**Utilization of Ironmaking and Steelmaking Slags.** The paper deals with the most important processes used for treatment of blast furnace and steelmaking slags and with the most important ways of their utilization. The method of recycling of steelmaking slags that followed from the experiments of the authors, are described. Proposal for the way of utilization of one sort of ladle furnace slag is also included.

**4. W. Lehnert, R. Kawalla, D. Hübgen;** *TU Bergakademie Freiberg, Germany*

**Production of Highquality Bands and Sheets from Aluminium Alloys.** In last years a aluminium production has increased worldwide. For Germany a specially high increase of used Al is characteristic. Many works had to abandon more power spendin primary aluminium production of bands i.e. they had to outhouse it. This trend still continues. A data overview of production and consumption of Al illuminates present situation. The overview is fulfilled through technical data of production of bands in hot and cold rolling mills as well as heat treating shops. In the paper the best plants for experimental simulation are described as an assumption for the setting of up-to-date technology and mathematical modelling. Additionally selected investigation results are presented.

**5. Ya. V. Frolov, I. Mamuzić\*, V. N. Danchenko;** *National Metallurgical Academy of Ukraine, Dnepropetrovsk, Ukraine, \*Faculty of Metallurgy University of Zagreb, Sisak, Croatia*

**The Heat Conditions of the Cold Pilger Rolling.** The influence of technological factors and constructive parameters of the cold pilger rolling mill on the warm conditions of deformation is observed. The dependences of the heat conditions of pilger rolling on deformation mode and preheating temperature are shown. There was a conclusion drawn about the expediency of combination of warming and cooling of the metal for keeping the deformation zone temperature within limit, which corresponds to the minimal intensity of the metal strengthening.

**6. M. Holtzer, J. Dańko;** *Faculty of Foundry Engineering University of Mining and Metallurgy, Cracow, Poland*

**The State of Art and Foresight of World's Casting Production.** The casting production is considered as one of the main factors influencing the development of world economy. Actual capacity of the world's casting production, which is higher than 60 million metric tones per year, is strongly diversified. The last decade brought significant changes in the world map of the greatest casting producers. Globalization and transformation of economic systems is reflected by variations of foundry production in different countries, moreover the globalization of economy is regarded not only as a chance but also as a menace for the European foundries. The state of art and foresight of world's casting production is discussed in the paper on the basis of the latest statistical data. The progress gained during the last few years in foundry engineering is shown as a way to further development of foundry technology.

**7. J. Zrník, I. Mamuzić\*, S. V. Dobatkin\*\*;** *Comtes FHT, Ltd., Plzen, Czech Republic, \*Faculty of Metallurgy University of Zagreb, Sisak, Croatia, \*\*Moscow Institute of Metallurgy and Materials Science, Russian Academy of Sciences, Moscow, Russia*

**Recent progress in high strength low carbon steels.** Advanced High Strength Steels (AHSS), among them especially Dual Phase (DP) steels, Transformation Induced Plasticity (TRIP) steels, Complex Phase steels (PS), Partially Martensite (PM) steels, feature promising results in the field. Their extraordinary mechanical properties can be tailored and adjusted by alloying and processing. The introduction of steels with a microstructure consisting at least two different components has led to an enlargement of the strength level without a deterioration of ductility. Furthermore, the development of ultra fine-grained AHS steels and their service performance are reviewed and the new techniques are introduced. Various projects have been devoted to develop new materials for flat and long steel products for structural applications. The main stream line is High Strength, in order to match the weight lightening requirements that concern the whole class of load bearing structures and/or steel components and one of the most investigated topics is grain refinement.

**8. S. Dobatkin, J. Zrník\*, I. Mamuzić\*\*;** *Baikov Institute of Metallurgy and Materials Science, Russian Academy of Sciences, Moscow, Russia, \*Comtes FHT, Ltd., Plzen, Czech Republic, \*\*Faculty of Metallurgy University of Zagreb, Sisak, Croatia*

**Nanostructures by Severe Plastic Deformation of Steels: Advantages and Problems.** Now it is well established that severe plastic deformation (SPD) at low temperatures leads to ultra-fine grained structure with grain size of nano- and submicro-scale. This structure determines enhanced

mechanical and unusual physical properties. Our presentation is aimed to consider the formation of nano- ( $d < 100$  nm) and submicrocrystalline structure ( $100 \text{ nm} < d < 1000$  nm) in steels during SPD by torsion under high pressure and equal channel angular pressing. Structure formation dependencies on temperature deformation conditions, strain degree, chemical composition, initial state and pressure are considered. The role of phase transformations for additional grain refinement, namely, martensitic transformation, precipitation and dissolution of carbide particles during SPD and others, is underlined. Mechanical properties of several steels made by SPD are compared in relation to their structure and discussed.

**9. F. Vodopivec;** *Institute of Metals and Technology, Ljubljana, Slovenia*

**Review of the Lectures of Materials - Section "A".** 188 summaries were selected for this section of the symposium. It is, thus, understandable that in the range of time given, it was not possible to prepare a real survey, but only a short recording of main topics investigated and of the purposes aimed. To obtain a better overview on the content of this section of the symposium, the summaries were classified in 16 groups on the base of the content: Processing of ferrous and non ferrous alloys, Powder metallurgy, Physical metallurgy, Mechanical properties, Wet and dry corrosion, corrosion resistance, Surface technology, Computer calculation and modelling, Composites, Methodology of investigation, Aluminium and magnesium alloys, Non ferrous alloys, Welding, microstructure and properties of welds, Nano and amorphous alloys, Application and degradation in service, Miscellaneous, Non metallic's.

**10. E. Mihok;** *Faculty of Metallurgy, Technical University of Košice, Košice, Slovakia*

**Review of the Lectures of Process Metallurgy - Section "B".** The section contained 113 papers. According to their scope they were subdivided into fourteen groups: Coke production, Sintering of fine materials, Pig iron production, Steel production, Non - ferrous metals, Foundry metallurgy, Refractories, Production of ferroalloys, Thermal energetics, Environment aspects, Smelting reduction, Welding, Inorganic materials, Miscellaneous.

**11. P. Fajfar;** *Faculty of Natural Science and Engineering, University of Ljubljana, Ljubljana, Slovenia*

**Review of the Lectures of Plastic Processing - Section "C".** 69 contributions have been received for Section C on Plastic processing of materials. According to their scope they were subdivided into 9 groups: Plastic deformation, Plate and shape rolling, Extrusion, Wire drawing, Tubes production, Sheet metal forming, Reheating process, Modernization, Miscellaneous.

**12. P. Fajfar;** *Faculty of Natural Science and Engineering, University of Ljubljana, Ljubljana, Slovenia*

**Review of the Lectures of Metallurgy and Related Topics - Section "D".** 93 contributions have been received for Section D on Metallurgy and Related Topics. The most numerous are the contributions of the scientists from Slovakia (58), Ukraine (22), Croatia (15), Poland (7), Russia (4) and s. o. with the exception of four contributions presented from enterprises, the rest of them are results of scientific work in research and educational institutes. Topics of Section D are: Marketing and management in metallurgical and mining enterprises, Mineral engineering, Energy sources, Environment pollution, Heat transfer, Science on materials, Computer science, Other applications.