Editorial

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Biographical notes: Janez Grum is a Professor of Materials Science at the Faculty of Mechanical Engineering, University of Ljubljana, Slovenia. He is also the Founder and Editor-in-Chief of a new journal, the *International Journal of Microstructure and Materials Properties (IJMMP)*. He is the Editor of six NDT conference proceedings, five ASM, Marcel Dekker and Taylor & Francis book chapters and five books with several reprints. He has also published more than 200 refereed journal papers on heat treatment and surface engineering, laser materials processing and materials testing, including non-destructive testing.

Aleš Hančič, PhD, is currently Managing Director of the Slovenian Tool and Die Development Centre TECOS. In the recent year he has also been employed at the Faculty of Mechanical Engineering, University of Ljubljana as a research and teaching assistant and as a research associate lecturer at the College of Polymer Technology in Slovenj Gradec, where he is also in the process for the election of Assistant Professor. He was editor of one conference proceedings and of one technical newspaper. He has published more than 50 scientific and technical papers on metal and non-metal material forming, sensoric and nano-materials.

The second part of this special issue of the *International Journal of Microstructure and Materials Properties* comprises five extended papers presented at 9th International Conference on Industrial Tools and Material Processing Technologies (ICIT&MPT) held in April 2014 in Ljubljana. Papers are discussing respected fields of toolmaking, material processing and production technologies, together with experts in all supporting activities that are essential for a successful operation of a tool shop.

The following papers have been included in this issue:

Smoljan et al. presented Computer modelling of as-quenched hardness and microstructure composition of steel. A joined thermo-metallurgical approach is applied to complete the numerical model of phenomena of steel quenching. Because of wide range of applicability and ease of use of finite volume method, this numerical method was suitable to create integrated computer program for simulation of transient temperature field, microstructure transformations and mechanical properties during quenching of steel

components. By experimental verification of the computer simulation results it has been found out that, phenomena of steel quenching could be successfully described by the proposed computer model.

Kulu et al. discussed wear resistance and selection of steels, hardmetals and hardfacings for abrasive wear conditions. The abrasive wear tests of steels, hardmetals and cermets were performed using two different abrasive wear method according to ASTM standard G65 and abrasive impact wear. The dependence of wear resistance on hardness and toughness of steels is clarified, the wear maps are composed and recommendations for material selection for realistic wear conditions and applications are proposed.

Felde and Mucsi analysed interaction between recrystallisation and nitride precipitation in cold rolled al-killed low carbon steel. On cold rolled steel specimens thermoelectric power tests and microstructural investigations have been performed in order to analyse the conditions of the so-called retardation phenomena occurring during recrystallisation. This phenomenon has a great importance in industrial processing of Al-killed low carbon steels, because the interaction between the two processes can result in a good deep-drawable pancake type microstructure. Retardation in recrystallisation during isothermal heat treatments was observed only if the precipitated fraction of nitrides was between 50 and 90% independently of heat treatment temperature. The rate of recrystallisation process is also strongly affected by the nitride particles. During isothermal heat treatments at temperatures below 528°C precipitation prevents recrystallisation, between 528°C and 590°C the two processes occurs concurrently whilst above 590°C recrystallisation takes place before the nitride precipitation.

Bergant et al. presented modelling of remelted and heat affected zone during laser alloying of c45 steel with nickel-based powder. The aim of the research was to develop a simplified numerical model to predict the formation of the melt pool and the heat affected zone in single track laser alloying. The developed finite element model was based on the temperature field calculation using Fourier equations. The unknown coefficients such as surface absorption coefficient, volumetric efficiency and beam distribution coefficients are set according to cross-section geometry data, obtained from laser alloying experiment. The full factorial experimental design was used to evaluate the influence of power and scan feed rate on remelted cross-section area and microstructure. The calculated height and depth of melt pool and heat affected zone were in fairly good agreement with the experimental data.

Ciski et al. analysed thermal stability and microstructural wear resistance properties of tool steel subjected to deep cryogenic treatment. The article analyses the cause of the exothermic effect occurring in the heating cycle of tool steel samples subjected to deep cryogenic treatment (DCT) process. X153CrMoV12 steel was austenitised at 1333 K, quenched to the room temperature and deep cryogenically treated at 93 K. The deep cryogenic treatment studies showed the presence of not reported so far in the scientific literature energetic effect with a maximum at a temperature of about 218 K, with the presence of the carbon atoms. The observations of the microstructure and substructure of martensite, carried out using scanning transmission electron microscopy, showed that the deep cryogenic treatment promote refinement of martensite sub-grains, which is connected with the state of stresses in martensite crystals. Changes in the microstructure and substructure of the matrix and the way of precipitation of the strengthening phases improved resistance to wear by friction.

All papers have been reviewed according to journal procedures and standards. We sincerely thank all authors for their valuable contributions and having observed all reviewers comments and suggestions. My thanks also go to all reviewers for their effort in reviewing papers. Our great thanks are due also to our co-worker Mr. Franc Ravnik, BSc, who took care of the coordination among the reviewers and the authors and prepared the papers for publication.

We sincerely hope that the papers published will be a useful source of information for engineers and researchers at their professional work in fields of toolmaking, material processing and production technologies.