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## 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.

Janez Marko Slabe is a Director of Slovenian Tool and Die Development Centre and was the organiser of the International Conference on Industrial Tools and Material Processing Technologies (ICIT&MPT). He was the Chairman of the International Scientific Committee and Chairman of the Organising Committee of the 8th edition of the ICIT&MPT conference and also the Editor of the conference proceedings. As author or co-author, he published 12 original scientific papers and more than 30 conference papers mainly on the field of laser materials processing, materials testing and characterisation and non-destructive testing.

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The present special issue of the *International Journal of Microstructure and Materials Properties* comprises ten papers discussing theoretical and practical knowledge on current world trends in the field of industrial tools and material processing technologies. Papers were selected among those presented at the 8th International Conference on Tools and Material Processing Technologies (ICIT&MPT 2011) held from 2 to 5 October 2011 in Ljubljana, Slovenia. All papers were extended and reviewed by distinguished reviewers according to journal procedures and standards.

The following authors contributed their papers with the following topics:

Vilar et al. presented multilayer laser-assisted deposition of NiCrAlY and René N4 on single crystal superalloy substrates. The deposited material presents a columnar dendritic microstructure consisting of arrays of similarly oriented dendrites. Heat treatments capable of creating the proper particle microstructures were devised.

Bergant and Grum studied the influence of laser deposition technique on surface integrity of 12 Ni maraging tool steel. The aim of this investigation was to study the material properties of two coating deposition techniques on 12 Ni maraging tool steel specimens, i.e., laser cladding and hybrid process of flame spraying with subsequent laser remelting of sprayed coating. The subsequent precipitation annealing is necessary to obtain the material with similar properties as base material. The research showed that the material quality of laser-cladded layers was better than that of layers that were sprayed and laser remelted.

Dobrzański et al. investigated the effect of laser surface alloying with ceramic particles on microstructure of a commercial hot work tool steel. The aim of this work was to determine the optimal laser treatment parameters to achieve good layer mechanical properties of alloyed surface layer. For investigations of the alloyed surface layer, they used microhardness measurements and microstructural and microchemical analysis.

Ocaña et al. presented Laser Shock Processing (LSP) for the enhancement of surface properties and fatigue life of high-strength steels and Al and Ti alloys. Profiting by the increasing availability of laser sources delivering intensities above  $10^9$  W/cm<sup>2</sup> with pulse energies in the range of several Joules and pulse widths in the range of nanoseconds, LSP is being consolidated as an effective technology for the improvement of surface mechanical and corrosion resistance properties. Residual stress profiles and associated surface properties modification successfully reached in typical materials under different LSP irradiation conditions were presented.

Luo investigated the relationships between dislocation motion and microstructure evolution of FCC metals during LSP. Aluminium alloy and austenitic stainless steel were selected for LSP by pulsed Nd: YAG laser. Microstructure evolution induced by laser shock was analysed via TEM and Inverse Fast Fourier Transformation, and dislocation configuration was discussed. He proved that the increase of surface hardness and residual compressive stress can be attributed to complex dislocation configurations.

Hoffmann and Dierken worked on recent developments in laser machining of tools. They presented key components for high flexibility and productivity in laser machining of tools. They also developed a new system technique of the laser cladding process for tool shop of a leading automobile manufacturer.

Torralba et al. discussed Powder Injection Moulding (PIM) for processing of small parts of complex shape. This process combines the high capability to produce complex shapes of the PIM with the advantages of a powder route to process metallic, ceramic or composites materials. Production of the part can be industrially controlled, with the PIM process as a real alternative to produce complex parts in a high rate production method.

Smoljan et al. worked on numerical modelling of hardness distribution in as-quenched steel components which was performed by Jominy test. Yield strength and fracture toughness distributions were estimated using the Hahn-Rosenfield approach. Fatigue resistance was estimated based on predicted microstructure and hardness.

Rosso and Peter presented new frontiers for thixoforming. The paper presented an overview of different production techniques for light alloy components for critical areas. Comparison with traditional methods, in particular high- and low-pressure die casting technologies, in terms of process parameters and properties was illustrated and discussed.

Tisza presented recent development trends in sheet metal forming. Several facts such as economy of the sheet-forming processes concerning the material and energy consumption, as well as the overall cost efficiency, were analysed. In this paper,

developments in sheet metal forming were overviewed concerning the materials and process developments and application of various methods of computer-aided engineering.

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.

We greatly appreciate the expert work of Asst. Prof. Dr. Janez Marko Slabe, Director of TECOS-Slovenian Tool and Die Centre and conference Chairman for his advice and assistance in selecting the 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 published papers will be a useful source of information for engineers and researchers to their professional work.