
Editorial

Janez Grum

Faculty of Mechanical Engineering,
Aškerčeva 6, Ljubljana, Slovenia
E-mail: janez.grum@fs.uni-lj.si

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.

The present issue of *International Journal of Microstructure and Materials Properties* comprises seven extended papers presented at *2nd Mediterranean Conference & New Challenges on Heat Treatment and Surface Engineering* held in Cavtat 2013 and two spontaneous papers discussing mechanical and microstructure properties of various materials.

The following papers have been included in this issue:

Kulu et al. studied the structure and properties of sprayed and welded cermet hard phase reinforced Fe-matrix-based coatings. The aim of the study was to elaborate new composite coating based on the cermet hard phase for the heavy abrasive wear conditions. They used WC-based hard metal and Cr-based cermet powders, which are produced by disintegrator milling. As matrix materials, Cr-Ni-steel and FeCrSiB alloy powders were used. Three different wear testing methods were applied: abrasive rubber wheel, abrasive erosive and abrasive impact wear. Wear rates and relative wear resistance values were determined.

Kacprzyńska-Golacka et al. presented the comparison of antiwear and fatigue properties in higher temperature for layer composites. They used hybrid surface treatment technology as a combination of a gas or plasma nitriding (PV) process of deposition of hard antiwear coating by means of PVD methods. The paper presented the results of two different wear tests for two different hybrid layers: PN+AlCrTiN obtained on the working steel. Tribological tests were carried out for temperatures between 25°C and 600°C. Fatigue tests indicated the changes of length and density of cracks during the forging process.

Petrova and Shestopalova analysed oxi-nitriding of alloyed steels with forming of nano-scaled oxide film. Thermo-chemical treatment of chromium corrosion-resistant steels was investigated consisting of surface oxidising and subsequent nitrating. As a result, internal nitrating zone was formed under the nano-scaled oxide layer consisting of

chromium nitrides dispersed in the ferrite matrix. Such composite coating showed the increase in wear resistance comparing with the classical nitriding.

Milinović et al. researched boride layers growth kinetics of carbon steel. Pack boronising was carried out in the temperature range 870–970°C with duration 4–8 h. Average thickness of boride layers ranged from 69.9 µm to 239.2 µm. They investigated the influence of temperature and duration on average thickness of boride layer, thickness of the compact part of layer and its toothiness as well as the change of volume share of boride phase. Mathematical models showed functional correlation obtained by statistical methods.

Badul and Kucharieva applied active powders at fluidised bed heat treatment technologies. The method was used for sherardising, alitising, carbonitriding, nitrocarburising, carburising or boronising. Chemically active powders were compared with chemically inert powders, used in conventional fluidised bed treatments. They presented the feasible ways to used fluidisation by gas flow or by mechanical vibrations for different processes and their main stages. Comparison with the conventional methods of fluidised bed thermo-chemical treatment was given.

Dragomir et al. studied the mathematical modelling of low alloy steel carburising in less common carburising media as paste or urban fuel gas. The mathematical models developed for the carbon gradient, hardness profile and portion of austenite in the carburised layer were represented by statistical method.

Onan et al. discussed polymer quenchant characteristics during quenching process of tool steels. The control of heating/cooling (quenching) conditions directly affects the final mechanical properties of material. Recently, several polymer quenchants were used in the heat treatment application of aluminium alloys and steels. The polymer quenchants minimise the cooling rate, so that the possibility of distortion and cracking is reduced. They focused on the effects of air and polyalkylene glycol. Different concentrations on the cooling characteristics of tool steels were used. The effect of cooling characteristic was observed using a digital image capture processing during the experiments.

Zhang treated electronic band structure of indium-based transparent and conductive multicomponent oxide. The electronic band structure of indium oxide (In_2O_3), indium tin oxide (ITO) and indium tin tantalum oxide (ITO:Ta) was investigated. This study showed that the introduction of Ta into indium tin oxide (ITO) upgraded the Fermi level and improved the splitting of the conduction band, which were suitable for wide application because of their specialised properties.

Yan and Li studied the effect of Si morphology on the microstructure and wear property of ZA48 alloy. Metallographic studies showed that the phase Si mainly existed in the matrix with fine bar shape eutectic Si phase and block primary phase Si. Under oil lubricant wear condition, the abrasion wear mechanism was seen at all test loads. The hard Si particles were protruded from matrix, which formed a thin film at the contact surface between the composite and the counter face and improved the wear resistance of the Zn-Al alloys.

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.

We greatly appreciate the expert work of the guest editors Professor Dr. Božo Smoljan from the Faculty of Engineering University of Rijeka, Croatia, and Professor Božidar Matijević from the Faculty of Mechanical Engineering and Naval Architecture University of Zagreb for their advice and assistance in selecting the papers. Our great thanks are also due 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.