Editorial

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Biographical notes: Janez Grum is a Professor of Materials Science in the Faculty of Mechanical Engineering at the University of Ljubljana. He is also the founder and Editor-in-Chief of a new journal, *International Journal of Microstructure and Materials Properties* (IJMMP), and has been Editor of the *Journal News of Society for Nondestructive Testing*, Slovenian Society for Non-Destructive Testing, Ljubljana, Slovenia since 1994. He is the Editor of the six NDT conference proceedings, two ASM and Marcel Dekker book chapters and five books with several reprints. He has also published in more than 100 refereed journals and more than 300 conference papers on heat treatment, laser materials processing and materials testing, including nondestructive testing.

Papers gathered in this issue are spontaneous and therefore differ much in their contents. They all cover journal topics that mainly discuss ferrous alloys at various machining and heat treating processes or at various in-service conditions. Destructive and non-destructive methods are included in the research. As a follow-up, there will be short presentations of papers included.

Canale *et al*. presented an 'Overview of factors contributing to steel spring performance and failure'. Leaf springs and coil springs are commonly used in the motor vehicle industry. Premature fatigue failure is a common failure mode. However, the reasons for these failures may be more complex and include: unsuitable design steel alloy chemistry, presence of non-metallic inclusions, heat treatment method technology, properties of springs, and grain boundary embrittlement and intergranular cracking. This paper will provide an overview of spring steel: chemistry, heat treatment, residual stress, fatigue failure and failure analysis of various types of springs.

Grum presented 'Influence of various induction-heating and grinding conditions on residual stress profiles'. Additional grinding of induction hardened surface deteriorates the stress state in the surface layer, since grinding has always induced tensile stresses. There is also a discussion on the right selection of grinding conditions in order to preserve favourable compression residual stress profiles after the hardening of induction surface.

Debarberis *et al*. studied the ductile-to-brittle transition temperature of phosphorus segregation on typical reactor pressure vessel steel. Tensile properties, hardness and thermoelectric, magnetic Barkhausen and position annihilation were studied. The results obtained are an important source of information to understand the behaviour of materials with phosphorus segregation and their sensitivity to fracture.

Datta *et al*. studied the effect of Submerged Arc Welding (SAW) process parameters and statistical modelling. Nonlinear mathematical models have been developed in order to reveal the direct and interactive effects of process parameters on mechanical properties of butt weldment by SAW. A statistical model based on factorial design without replication experiments was constructed with different levels of process parameters, various bead quality and performance parameters. Coefficients of the models were calculated by multiples linear regression method. The significance of the coefficients for each of the factors in the models has been calculated by Analysis of Variance (ANOVA) Method.

Gang *et al*. give a 'Stress analysis and fatigue life estimation for four types of super-alloy-welded joints'. By means of the finite element analysis software ANSYS, stress concentration coefficients of super alloys-welded joints were calculated. With the method of group comparison, the relationship between these calculated results and the real fatigue life was analysed. The SEM fracture analysis revealed that slag, microcracks on the surface of welding seams were dominant factors in cutting down the fatigue life.

Quispitupa *et al*. studied hydrogen embrittlement of AF 1410 steel and fatigue at the stress ratio 0,4 and at 1 Hz loading frequency. The results show up to four times higher crack growth rate at specimens without exposure to hydrogen. Scanning electron microscope and atomic force microscope studies, as well as fracture surface analysis, were conducted to correlate the fracture modes.

Rehim *et al*. discussed corrosion of metal microstructure for grey and ductile cast iron in salt solutions. Two types of cast iron were employed in this work. Grey cast iron is the first type, and ductile is the second one. Two specimens of the grey cast iron sample were used: one was kept without heat treatment, and the second heat-treated by completely ferritisation regime. The potentiodynamic technique was applied for collecting corrosion data of two types of cast iron in HCI solutions in the absence and presence of thiourea as inhibitor. The optical microscope used for investigating the microstructure of grey and ductile cast iron, corrosion resistance and corrosion rate are collected directly from potentiostat. Adsorption parameters are deduced using the kinetic model and Flory-Hugine isotherm when inhibition mechanisms were investigated.

El-Nekhaly presented the electrochemical nondestructive testing method for forecasting of physical and mechanical properties of various steels. The first experimental application was used to investigate the effect of melting, casting and rolling processes on mechanical and physical properties of carbon steel bars. In the second experimental application, the effect of casting process on the mechanical and physical properties of 14% Mn steel was investigated. The investigation of 14% Mn casting process was made at different conditions for used sand mould; firstly, bentonite was used as binding material, and secondly, sodium silicate as different binding material. The investigation effect of the casting process was obtained in view of the relations of mechanical and physical properties of unknown samples.

Janovszky *et al*. presented 'Identification of metastable phases in Fe-Ni-based amorphous alloy'. The crystallisation of Fe-Ni type of amorphous alloy was studied using the DSC and XRD method. XRD was employed to determine the crystallisation product at different temperatures; the precipitates were found to be the (Fe, Ni) and Fe_2B, BFe_2, Ni_{31}, Si_{12} phases.

Srinivasan *et al*. studied 'Microstructure and mechanical properties of low-pressure cast AZ91 magnesium alloy'. The improvement in mechanical properties is attributed to the finer structure and less defects seen in the castings obtained by the micro low-pressure casting process.

Special thanks are due to the authors contributing their papers to this issue of the IJMMP. They are the results of the very critical work of reviewers and the authors. It can be said that the papers satisfy high standards of quality.

Our great thanks are due also to our co-workers, Mr. Franc Ravnik (BSc) and Ms. Nevenka Majerle, who took care of the coordination among the reviewers and the authors, and prepared the papers for the publication. Many thanks are also due to the Composition team of the Inderscience Publishers for the assistance offered in preparing the issue.

We sincerely hope that the papers presented in this issue will be valuable sources of information for researchers in various scientific fields, and users in the field of materials, design and production.