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.

The present issue of the *Int. Journal of Microstructure and Materials Properties* comprises 16 extended papers presented at 12th International Conference of the Slovenian Society for Non-Destructive Testing titled Application of Contemporary Non-Destructive Testing in Engineering held in Portorož on September 2013.

The following papers have been included in this issue:

Li et al. presented defect detection of thin shell shapes by ultrasonic transducer array. The ellipse localisation imaging algorithm was applied to identify the defect's orientation and localisation. Wavelet transform was used to obtain the defect's location parameters. A series of experiments for detecting the artificial defect in the specimen showed that the direction and location of defects can be detected effectively.

Agostinho and Puybouffat examined low pressure steam turbine shrunk by discs method. This paper presented the process followed from the stage of receiving the specification through the development of the procedure, to the performance of the inspection. During the regular maintenance program the client requires that a non-intrusive examination of these areas be carried out, without dismantling the turbine. The only means of inspecting the suspect area is to use an ultrasonic test method.

Solodov studied resonant ultrasonic imaging of defects for advanced non-linear and thermosonic applications. The non-linear applications of this concept demonstrated both the higher harmonic and frequency mixing modes. The defect resonance was shown to be accompanied by depletion of the excitation frequency vibration due to non-linear frequency conversion to higher harmonics. The local generation of higher frequency components provided a high thermal defect response in such acoustically non-linear thermosonic mode.

Cardoso et al. measured oxide thickness as a suitable tool for remaining life evaluation in power plants. The oxide layer formed in the inner wall of those pipes is the main cause of overheating failures. The paper compared the internal oxide layer thickness measurements of pipes performed by ultrasonic technique and by metallography, in

different ranges of thickness layers. The paper also analysed the remaining life calculation based on the measurement of the oxide layer thickness. The results obtained from the calculation were supported by a microstructure characterisation.

Sideridis and Venetis worked on thermal expansion coefficient of particulate composites defined by the particle interaction. A theoretical model for the evaluation of the thermal expansion coefficient of particulate composite materials was presented. The model took into account the influence of neighbouring spherical inclusions on the thermal expansion of the composite material consisting of the matrix and filler. The research goal was to study the influence of the particle using variations of their distribution i.e. body centred cubic, face centred cubic, edge centred cubic, or their combinations, in order to prove that the volume fraction was not the only parameter which determined the thermomechanical constants.

Vilaça et al. presented a new NDT system composed by a planar eddy currents probe, electronic devices for signal generation, conditioning and conversion, automated mechanised scanning and analysis software. The experimental results in aluminium alloy welded by friction stir welding showed that the system was able to detect imperfections around 50 μm, which contributed to increase the reliability.

Kek et al. applied acoustic emission testing in injection moulding process.

The acoustic emission was measured on a new injection mould and injection mould with the visible crack on the cavity's surface. The results of acoustic emission testing on the crack defected tool steel insert revealed that the energy and intensity of the captured AE signals was higher compared with that captured on the brand new engraving insert under same processing conditions.

Djordjevic discussed laser ultrasonic guided wave methods for defect detection and composite materials characterisation. These methods enabled in-plane ultrasonic signal testing and very accurate measurements of the ultrasonic directional velocities. Additionally, sensing of the guided wave modes changes, in the geometrically complex composite structures, enabled detection of the material structural damage. Experimental data demonstrated reproducibility and feasibility of such tests to sense defects and characterise micro structural damage in the composite materials.

Dobmann et al. applied electromagnetic technique monitoring of ageing phenomena. Micromagnetic, Multiparameter, Microstructure and Stress Analysis was developed and used to characterise ageing phenomena in pressure vessel and pipeline steels as thermal ageing and neutron degradation as well as material states when thermal ageing and low cycle fatigue were superimposed.

Rastegaev et al. worked on real time acoustic emission methodology in effective tribology testing. They reviewed available knowledge on this topic and aligned it with original investigations of authors bridging standard tribological practice and modern AE technologies. Special attention was paid to quantification of the correlation between the AE features and friction induced damage.

Polajnar et al. presented mathematical modelling of gas metal arc welding process using sound pressure measurements. Measurements and analysis of audible sound, generated by the gas metal arc welding were presented. Results showed that more information about the welding process were embedded in the sound signal as in the welding current signal or/and in the welding voltage signal. They developed the mathematical model for a calculation of sound from the welding current which can be implemented for the calculation of welding process parameters in real time applications.

Bergant et al. research the reliability of ultrasonic detection of embedded defects in glass fibre reinforced composite. They used pulse-echo ultrasonic C-scan method for examination of various processing defects in a composite plate. Different frequencies and gate settings was used to find the best possible set of parameters to detect defects. The scanning results showed good visibility of PVC foils, chips and porosity at the surface.

Thomas and Ashigwuike characterised defects in ferromagnetic and non ferromagnetic material using an electromagnetic acoustic transducer. In this work a finite element analysis of an Electromagnetic acoustic transducer was presented. EMAT is an emerging technology that provides a non-contact process of testing materials compared to ultrasonic sensors that requires a coupling medium. The acoustic properties of the material were investigated, which involved the coupling of several physical parameters. Results obtained showed the model is capable of detecting defects in non ferromagnetic and ferromagnetic plates using an electromagnetic acoustic transducer.

Nobile and Bonagura presented recent advances on non-destructive evaluation of concrete compression strength. The aim of this study was to verify the accuracy of some of the most reliable and employed formulations between measured parameters, i.e., rebound index and ultrasonic pulse velocity, and compressive strength.

Simončič and Podržaj studied the applicability of welding force for spot weld quality assurance. They presented the relationship between time needed for expulsion occurrence and weld strength. The results were better than in the case of welding current. In order not to limit this approach only to welds with expulsion, another variable was calculated from the welding force signal. They found out that the welding force variation is the sum of square differences of welding force and mean welding force. Although slightly less accurate than time needed for expulsion variable, it is not limited to expulsion welds.

Mazal et al. diagnosed the damage development of bearings and gears by acoustic emission method. They presented an overview of the contemporary applications of acoustic emission method for diagnosis and condition monitoring of anomalous that that occur during the operation of machines. The main attention was focused on operational diagnostics of axial and radial bearings. They also mentioned the possibilities of utilisation of AE method for complementary diagnosis of real state of gears and gearboxes.

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.