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) and has been Editor of the *Journal News of Society for Nondestructive Testing* by the Slovenian Society for Non-Destructive Testing, Ljubljana, Slovenia since 1994. He is also a member of the editorial board of several international journals. 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 more than 200 refereed journal papers and more than 400 conference papers on heat treatment and surface engineering, laser materials processing and materials testing, including nondestructive testing.

This year, our journal has become a bimonthly, which means six issues published per year. Such a frequency of issues requires a very intense cooperation of the authors, Editor and reviewers to make the period between the receipt of a paper in a reviewing process and its acceptance for publication as short as possible. It is our goal to assure the independence of the reviewers in the individual thematic fields, which will eventually contribute to an increased quality of published papers.

The papers that are published in the present issue treat mainly the investigations conducted on various composites. Vajralingam *et al.* used, in order to predict the elastic properties of the Al 2124-SiC particulate composite, Finite Element Analysis (FEM) in an artificial neural network. The ABAQUS Finite Element (FE) software has been used for the simulation of different Al-SiC composites that employ 20 in 3D models with different shapes, dimensions and volume fractions of SiC particles. The FE results are combined with an Eshelby analytical model. The FE results are used as input data for the artificial neural network programme for determining the effective properties of the composites.

The artificial neural network method gives results that are close to the FE simulation results. For the different methods used, they show variations of the effective elastic and shear moduli for different volume fractions of SiC particles in an aluminium substrate. A comparison of the elastic and shear moduli calculated with different methods show a deviation from the experimental results that is as small as around 10%, which confirms the suitability of the proposed calculation methods.

Dasgupta and Meenai dispersion-strengthened a matrix, *i.e.*, an Al-Cu (Al-2014) alloy, with SiC by casting and thus, improved the mechanical and wear properties of the composite. In the described research of wear resistance, expressed with a wear rate (m^3/m), the properties of the composite after the casting and precipitation hardening of the metal matrix with different loads are considered.

Liu *et al.* deal with a microstructure, using a microchemical analysis, and the mechanical properties of alkaline earth-doped lanthanum gallate with Al_2O_3 in order to improve bending strength. Ion electrical conductivity was measured by an impedance analyser. The obtained results indicate that an addition of 2wt% of submicron Al_2O_3 can obviously improve bending strength, but has no influence on the ion electrical conductivity.

Ozturk, in his paper titled 'Microstructure and indentation fracture toughness of mica glass ceramics', treats with a controlled crystallisation in a SiO_2-Al_2O_3-CaO-MgO-K_2OMgF system with a nucleating reagent TiO_2, P_2O_5 or ZrO_2 added in 0.5wt% to 1.0wt% of glass.

The investigation confirms that with different types of nucleating reagents, regardless of their fraction (0.5wt%–1.0wt%), the indentation fracture toughness increases from K_{Ic} = 1.37 MPa $cm^{1/2}$ to 1.69–1.77 MPa $cm^{1/2}$, whereas the hardness is preserved.

Tafat *et al.* analyse the microstructural and magnetic properties of a nanocrystaling $Fe80Ni_{20}$ alloy prepared by high-energy ball milling. After two hours milling operations, a bcc Fe (Ni) solid solution with a grain size of around 12 nm is obtained. The research results also include the characterisation of powder on Scanning Electron Microscope (SEM), X-ray Diffraction (XRD) and microanalysis and an analysis with a magnetic system for measuring the coercive force and residual magnetism as a function of the milling time.

Saheb and Yoong describe the processing and characterisation of new nanocrystalline Al_2O_3-fly ash Ceramic Matrix Composites (CMCs). It was found that the wet milling of the mixture for 18 h improved mixing, decreased the Al_2O_3 crystallite size to around 10 nm and reduced the fly ash particle size. After sintering for 16 h at a temperature of 1350°C with 10wt% and 20wt% of fly ash, a composite hardness ranging between 508 HV and 444 HV was obtained, whereas with 5wt% of fly ash, a composite hardness of 1325 HV was obtained.

Kulkarni *et al.* investigate the material transfer phenomena during sliding conditions using a pin-on-disk tribometer. Research was conducted using a metal indium as a pin and a single silicon crystal as a disc. Surface characterisation was carried out using an SEM and atomic force microscope. The nucleation and growth of such nanostructures were found to correlate with Fick's diffusion equation.

Balasubramaniam *et al.* optimise pulsed-current Gas Tungsten Arc Welding (GTAW) parameters with reference to an obtained maximum impact toughness of welds using the response surface approach. It is concluded from the Karush-Kuhn-Tucker conditions that the optimum impact toughness of 12 J is achieved when the process parameters are operated almost at the centre of the coded design.

Balasubramanian and Lakshminarayanan give a comparison of the mechanical properties obtained in the GTAW, Gas Metal Arc Welding (GMAW) and Friction Stir Welding (FSW) of the RDE-40 aluminium alloy is closely confirming with the AA 7039 (Al-Zu-Mg) alloy.

In the present research, the tensile strength, elongation, hardness, microstructure and fracture surface morphology of the GTAW, GMAW and FSW joints have been evaluated and the results are compared. In this investigation, it is found that the FSW joints of the RDE-40 aluminium alloy showed the superior mechanical properties of joints and this is mainly due to the formation of a very fine equiaxial microstructure in the weld zone.

Special thanks are due to the authors of the papers and particularly, the reviewers, who ensured the high quality of the papers published in the present issue. We hope that the papers concerned with composites and nanocomposites provide an important source of information to the researchers, manufacturers and users of composite materials.