
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 the 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 *International Journal of Microstructure and Materials Properties* comprises eight papers discussing investigations conducted on various fields of materials and materials properties. Papers were selected among spontaneously received papers while two were selected among papers presented at International Federation for Heat Treatment and Surface Engineering (IFHTSE) conference titled 'New challenges in heat treatment and surface engineering' held in Cavtat, Croatia 2009. All papers have been reviewed according to journal procedures and standards.

Yassar discussed evolution of geometrically necessary dislocations in plastically strained precipitation hardened materials. Ambient temperature tensile deformation experiments were performed on the aged specimens of an aluminium alloy AA6022 where microstructure was compared with the mechanical properties. The precipitate morphologies were characterised using transmission electron microscopy and the dislocation structure was analysed. The dislocation cell size and misorientation angle between dislocation cells evolved systematically with deformation at relatively small strain levels.

Degmova et al. studied characterisation of as-cast model steels with parametric variation of Ni, Mn, Si and Cr content. Studying the influence of Cr, Ni, Si and Mn alloying elements on the mechanical properties of steels a large spectrum of specimens were prepared. The composition of the model steels was inspired by typical base composition of WWER-1000 and PWR materials. The testing results showed that the ranges of ductile-to-brittle transition temperature differ between high and low Cr containing steels. An increase of Cr content leads to an increase of root mean square values of the Barkhausen noise measurements, independently on Mn and Si content. On the other side, amount of Ni influences the results of Barkhausen noise and relative Seebeck coefficient measurements.

Ćurković et al. presented statistical analysis of fracture toughness of SiC ceramics determined by Vickers indentation method. They determined fracture toughness (K_{IC}), of CVD SiC ceramics by measuring the crack lengths associated with Vickers indentation.

Fracture toughness was analysed by two-parameter Weibull distribution function (K_0), and the Weibull modulus (m). These parameters were determined by the linear regression method for K_{IC} data measured at various loads. They confirmed the measured fracture toughness following a Weibull distribution.

Senthilkumar et al. presented the effect of cryogenic treatment on the hardness and tensile behaviour of AISI 4140 steel. The reason for studying the tensile properties of steels is to ensure that steels used in shafts and gears have sufficient tensile strength to prevent failure when they are subjected to fatigue loads, and to provide basic design information on the strength. A comparative study on the effects of deep cryogenic treatment shallow cryogenic treatment and conventional heat treatment was made. They showed that the hardness of shallow and deep cryogenically treated specimens are higher whereas the tensile strengths are lower when compared to that of conventionally treated steel.

Park and Hijazi worked on simple analytic embedded atom potential for FCC materials. The potential parameters of this model were determined by fitting lattice constant, three elastic constants, cohesive energy, and vacancy formation energy using an optimisation technique. Parameters for Cu, Ag, Au, Al, Ni, Pd, and Pt were obtained and used to calculate bulk modulus, divacancy formation energy, and melting point. The predicted values were in good agreement with experimental results.

Bouhalais and Larouk studied primary recrystallisation behaviour of low carbon steel used for wiredrawing. The recrystallisation temperature was determined and found to be lower for the wire with higher wiredrawing area reduction. The two parameters k and n in Avrami law were calculated. A relationship between wiredrawing area reduction and recrystallised grain size was established. The recrystallisation activation energy is estimated and results compared with other material.

Arun and Divakar presented environmental effects on the interlaminar fracture in polymer hybrid composites. A systematic experimental investigation was carried out on glass/textile reinforced polymer hybrid composites with different volume fraction of the reinforcements, in order to study the effect of hybridisation on the interlaminar delamination fracture. The interlaminar fracture behaviour has been studied under bending loading using short beam bend test specimen. The influence of normal water, sea water and the saline water immersion on the behaviour of fracture has been identified. The nature of fracture as a function of the reinforcement volume and environmental conditions was identified by the SEM scans.

Krumes et al. investigated improvement of surface layer properties of some constructional steels induced by applying thermomodal duplex treatment. In this study, the case and core properties of treated steels have been investigated experimentally by using optical microscopy and SEM observations, X-ray diffraction analysis and measurements of microhardness profile in the cross-section of the treated steel specimens. Their work deals with the preliminary results obtained in investigation concerning application of the duplex treatment to the low-carbon and low-alloyed steel specimens. The duplex treatment included boronising and subsequent plasma nitriding processes. Results obtained by the above techniques are mutually consistent, and in accordance with the findings of other researchers.

We sincerely hope that the papers published will be a useful source of information for engineers and researchers at their professional work.