Editorial

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It has been five years since we started issuing *Int. Journal of Microstructure and Materials Properties – IJMMP*. I am proud to present you Vol. 5, No. 1. I would like to emphasise that it has been already the second year that the journal has been issued bimonthly. The journal comprises ten papers discussing various ferrous and non-ferrous alloys after different mechanical and thermal treatments.

Haddad et al. monitored metal powder by eddy current method. Nano-crystalline mixtures have been prepared by mechanical alloying using a planetary ball mill under several milling conditions. Their structures and magnetic properties were investigated. He examined the applicability of eddy current techniques in-process for monitoring of powder density and sizes of particles and the time necessary to structure variation. He concluded that eddy current methods can be used effectively to monitor the formation of the new mixture and it can indicate that the alloying formation occurs in a solid state during mechanical alloying process.

Gerosa et al. worked on stress corrosion cracking of aluminium alloy 7075 after ageing. They investigated mechanical strength and stress corrosion cracking by varying the ageing steps. The results have been discussed by varying the experimental conditions and compared. Each ageing step has been investigated with mechanical and corrosion cracking tests.

Campos-Silva and Ortíz-Domínguez evaluated growth of Fe_2B layer obtained by the paste boriding process in AISI 1018 steel. This study evaluated the growth kinetics of Fe_2B hard coatings obtained by the paste boriding process at the surface of AISI 1018 steels. The treatment was carried out at different temperatures and exposure times using a 4 mm thick layer of boron carbide paste over the material surface. The boron diffusion coefficient was determined by the mass balance equation at the Fe_2B/substrate interface, assuming that the growth of boride layers obey the parabolic growth equation. The growth was related as a function of the boride incubation time, the boron surface content and the boron diffusion coefficient, in order to estimate the weight gain in the borided specimens.

Elhoud et al. worked on influence of microstructures changes on corrosion resistance of super duplex stainless steel. The microstructures were controlled by applying two different cooling rates of water quench and air from various heat treatment temperatures. The amount of ferrite and austenite and other precipitates were measured using optical and image analyser. Effect of microstructure on pitting corrosion of super duplex was investigated in 3.5% NaCl solution at 90°C. The results revealed that the ferrite percentage increased as the heating temperature increased to 1300°C. Metallographic results showed the presence of intermetallic phases. Back scattering analysis revealed presence of sigma (σ) and chi (χ) phase. The results show that the volume fraction of ferrite to austenite as well as the precipitation of harmful intermetallic phase during cooling process affected the corrosion resistance while intermetallic precipitates promoted pitting damage and decreased pitting potential to more active values.

Albuquerque et al. described quantification of the microstructures of hypoeutectic white cast iron using mathematical morphology and an artificial neuronal network. Mathematical morphology algorithms are used to segment the microstructures in the input images, which are later identified and quantified by an artificial neuronal network. The proposed system offers researchers, engineers, specialists and others a valuable and competent tool for automatic and efficient microstructural analysis from images.

Lach et al. studied maraging steel under quasi-static and dynamic compressive heating. In many applications like crash worthiness or ballistic protection the materials are loaded at high strain-rates. The most important characteristic of material behaviour under dynamic loading is the dynamic yield stress. Compression tests have been conducted at various strain-rates and temperatures to study materials behaviour. From strain-rate jump tests activation volume was determined in order to identify dislocation mechanisms of plastic deformation.

Mohanty et al. determined a new approach of fatigue crack growth rate from experimental data by incremental polynomial and exponential methods. The determination of crack growth rate from laboratory observations of crack length and number of cycles is certainly a tedious job in order to considerably reduce the scatter in the test results. There are several curve-fitting methods currently in use including the standard ASTM methods. Several methods are in use to determine crack growth rate from raw experimental a-N data. The most attractive technique is to fit a polynomial through the experimental data and differentiating it to obtain crack growth rates. The piece-wise curvefit by five or seven-point incremental polynomial method suggested in ASTM standard may partially overcome these difficulties. However, it is time consuming and also requires much effort to get better smoothness in crack growth rate curve. The proposed exponential equation is proved useful for calculating crack growth rate. An alternative technique has been presented and has been found to be efficient in determining the crack growth rate in 2024 T3 and 7020 T7 aluminium alloy specimens.

Venkatachalam et al. presented microstructure and mechanical properties of 2014 Al alloy processed by equal channel angular pressing. It was found that the grain size gradually decreased with number of passes and the average grain size was about 0.252 μm. The hardness and tensile strength of given alloy remarkably increased up to 165 HV and 468 MPa, respectively. Correlation between tensile strength and hardness for the processing route was reported.

I believe the present issue brings to the readers new views and further information about materials and microstructures which significantly influence the properties.