
Editorial

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The present special issue of the *International Journal of Microstructure and Materials Properties* comprises 11 extended papers which present various methods of non-destructive testing. Papers were selected from papers given at the European NDT days in Prague at the end of 2007 and 2009. The conferences were organised by the Czech NDT Society under the auspice of European Federation for Non-Destructive Testing. The selected papers have been reviewed according to journal procedures and standards.

Chlada and Prevorovsky worked on obtaining acoustic emission signals and processing by give expert system. Accurate acoustic emission source location is the primary goal of the defect analysis following its detection. The source localisation is mostly based on arrival time differences of signals detected by several transducers. The authors presented an improved version of the wave arrival detection algorithm emulating an expert system. The new algorithm is based on signal waveform analysis taking into account the signal energy and trend of local gravity centre. The method has been proved in many applications as reliable enough, fast and easily implemented.

Prevorovsky et al. presented non-linear time reversal ultrasonic pseudo-tomography which became an effective methodology for NDT of complex structures, providing high sensitivity of damage detection. They proposed a procedure modification based on similar arrangement as ultrasonic tomography. Array of transducers is spaced on a structure with defect. Matrices of back-received signals and their spectra were analysed and their non-linear features were extracted along all wave-paths. Procedure application was illustrated on aircraft parts where pseudo-tomography is used to allocate defective zones.

Yoon et al. developed acoustic emission diagnostics system and wireless monitoring for damage assessment of concrete structures. In this work, the algorithm for determining the damage status of concrete structures was developed and some criteria for decision making were also suggested.

Salazar and Rodríguez studied of surface roughness effect in the behaviour of ultrasonic signals in steel with spectral and wavelets analysis. Fundamental spectral and wavelet signal analysis allowed quantitative determination of various characteristics. Specific behaviours were detected which varied according to the frequency of the probe. It was an initial step in the development of a thorough quantitative characterisation method of materials with various surface defects.

Ohtsu et al. investigated visualised techniques of non-destructive testing of concrete cracking. The impact-echo method was developed for non-destructive testing of defects in concrete. Resonance frequencies were applied to estimate the presence and the depth of defects in concrete. It was shown that the crack-depth is clearly visualised, even in the case when the crack is partially filled with water.

Kek and Grum applied acoustic emission signals during and after laser cutting process for determination of cut quality. Signals of AE are captured with contact PZT sensor. In this paper, the stress is on the correlation between measured signals of AE after termination of laser cutting for evaluation of laser cut quality.

Fiala et al. studied microstructural changes after dynamic loading of metal components for estimating residual life. A special X-ray technique was used, consisting at examination of the number and size of individual diffraction spots. The cells of the dislocation network formed in this way coagulated and grew in size under dynamic loading up to a certain number of cycles when the effect of cycling reversed and the cells gradually disintegrated.

Cretu and Pop discussed magnetoacoustic effect of ferromagnetic elastic carbon steel rods. They presented experimental measurements on the magnetoacoustic effect in carbon steel rods and an analysis of the shape of the line of the effect, obtained in the standing wave case. The aim of the analysis is to suggest a possible application of the effect in non-destructive evaluation of ferromagnetic samples.

Hajek and Sikula studied new possibilities to increase sensitivity of the ultrasound non-linear modulation methods. They presented comparison of two basic methods of ultrasonic non-linear modulation spectroscopy and proposed new possibilities for rising of sensitivity. In the first part, they discussed about using of analogue linear pre-filtration is used for the attenuation of exciting signals in sensing signal for the rising of signal processing dynamic range and the increasing of practical sensitivity.

Skrbek and Tomas applied quantitative non-destructive structuroscopy of cast iron castings for vehicles. The expression of this description in a plane using bidimensional vector of tension strength or yield strength offers new useful relations to manufacturing metallurgy. Mathematical models among physical and mechanical properties were derived by statistical analysis. The MAT method is developed for thin-wall castings. Magnetic hysteresis NDT method exploiting large data file created by voltage impulse induced in detection coil winded onto specimen. The combined testing by device for remanent magnetism measurement and ultrasound impulse device with its touching probes placed onto surface of as-measured object together with wall-thickness tester for thick-wall castings.

Grimberg et al. used eddy current to examine steam generator tubes from power plants using eddy current transducer with rotating magnetic field. The method presents the advantages of a complete inspection of tube's surface at one passing. They used a super resolution algorithm to increase the precision of discontinuity localisation.

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