PREFACE

This special issue presents 21 selected peer reviewed papers from the 2nd Brazilian Symposium on Functional and Structural Materials (FUNCMAT 2013), held in Rio de Janeiro, Brazil, on April 25-26, 2013. These articles provide an up-to-date knowledge concerning the field of functional and structural materials such as shape memory alloys, geopolymers, adhesives, composites and special alloys. The articles therein also deal with investigations on materials used in manufacturing processes like machining, welding, coating and adhesive bonding.

In the first part, six papers addressed key issues concerning welding and coating processes. The Finite Element Method was used in the first two papers. Rezende *et al.* have proposed a thermomechanic axisymmetric model to assess the Heat Affect Zone extensions and residual stresses distribution in circumferential butt weld pipe joints of superduplex stainless steels. Pacheco and Pacheco have investigated the temperature distribution in Friction Stir Welding process. The results presented in these two works show a good agreement with experimental data, indicating that the numerical models proposed by the authors are capable of capturing the main characteristics of the each process studied. Gomes *et al.* have been worked on the development of welding procedures for chain and accessories for application in mooring systems of oil platforms. Their paper focuses on the relationship between the chemical composition of the deposited weld metal and the mechanical properties of the joint. Welding is also the subject of the investigation presented by Dias *et al.*. They propose the optimization of welding parameters through the process of resistance spot welding, applied to Interstitial Free (IF) steel sheets in order to increase the life of conventional copper electrodes. Royse *et al.* have evaluated the microhardness and the microstructure of cobalt base superalloy coating deposited by gas tungsten welding process (GTAW) on steel SAE 4140. The influence of welding parameters such as the welding current was invertigated. Alves *et al.* have studied the interface properties of NiCr and Al thick coatings obtained by thermal spray process. Experimental data are compared with theoretical results given by a model proposed in the literature.

The five following works dial with the evaluation of corrosion and durability of metallic systems. Da Silva *et al.* use microstructure/life fraction correlation under creep conditions to evaluate the residual life of Cr-Mo steel. They have shown that transmission electron microscopy (TEM) analysis permit an accurate evaluation of the material degradation. Da Silva and Mattos propose a methodology to estimate the failure pressure of thin-walled metallic pipelines with arbitrary localized corrosion damage. This methodology can be a valuable tool for assessing the integrity of corroded pipelines. Santos *et al.* have evaluated the effects of the CO_2 concentration on the corrosion fatigue behavior

in tensile armor wires of flexible risers are used in offshore applications. Comprehensive corrosion fatigue tests were developed in environments up to 10 bar of CO_2 and the results have shown a fatigue life reduction. Gama and Morikawa present an experimental study on the application of piezoelectric dynamic strain sensors for monitoring the crack growth in fracture mechanics specimens. The results show that piezoelectric sensors can detect lower strain levels and lower increase in crack length than dynamic strain gages. Silva *et al.* have studied the methodology currently used for evaluate the remaining thickness in an aircraft outer wing skin after corrosion removal. The experimental investigation showed that the measurement by ultrasonic could be improved by considering the uncertainties inherent to the process.

Three papers focus on texture and microstructure evolution of special alloys. Raptopoulos *et al.* have investigated the evolution of texture in commercially pure warm rolled titanium by means of X-ray diffraction. The peak profile analysis data and the self-consistent predictions of texture evolution showed a good agreement with the experimental deformation texture evolution. Bacaltchuk *et al.* have evaluated the effect of magnetic field on the microstructure of annealing silicon steel. The results show that magnetic field seems not to affect nucleation of Goss grains but instead it seems to affect its boundary mobility. In a second paper about magnetic annealing, Castello-Branco *et al.* have addressed the grain growth concerning the treatment. The results of average grain size after magnetic annealing showed a microstructure formed by small grains and a few very large grains.

The next four contributions address composites and adhesive materials such as epoxy and geopolymers. Osanai and Reis have studied the influence of geometry and temperature on adhesive bonded joints under shear load. They have pointed out that the range of temperature which showed higher shear strength loss was from 30 to 50°C, considering the epoxy adhesive and the work conditions investigated in the paper. Neto *et al.* have proposed a numerical model to simulate the adhesion between the steel and the cementitious coating used in petroleum wells. The model was validated by the comparison between force versus displacement curves, obtained experimentally and numerically. Gomes *et al.* have investigated the use of different geopolymer compositions as adhesive applied to steel substrates. The results indicate that the geopolymeric adhesives show application potential joining steel plates with relative thermal efficiency. The use of geopolymers as matrix in composites with natural fibers have been investigated by Correia *et al.*. In this paper they show that sisal and pineapple leaf fibers can improve the mechanical performance of the geopolymer.

Closing this special issue, three papers deal with Shape Memory Alloys and machining processes. Aguiar *et al.* have developed a numerical/experimental work on the performance of Shape Memory Alloy helical springs when applied

as mechanical actuators. The results show that the model is in close agreement with experimental data. Silva *et al.*. have studied the effect of heat treatment and cutting velocities on machining cutting forces in turning of a Cu-Al-Be shape memory alloy. It was found that the resultant forces were higher in quenched alloy due to the presence of Shape Memory Effect. Araujo *et al.* have employed non-smooth systems to model different cutting processes including milling and oil drilling. They have established a qualitative comparison between homogeneous and non-homogeneous material showing the main differences in dynamical response.

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Silvio de Barros, Dr
Mechanical Engineering Department
Federal Center of Technological Education in Rio de Janeiro
silvio.debarros@cefet-rj.br

Pedro Manuel Calas Lopes Pacheco, Dr
Mechanical Engineering Department
Federal Center of Technological Education in Rio de Janeiro
calas@cefet-rj.br

Hector Reynaldo Meneses Costa, Dr
Mechanical Engineering Department
Federal Center of Technological Education in Rio de Janeiro
hectorey@cefet-rj.br

Ricardo Alexandre Amar de Aguiar, Dr
Mechanical Engineering Department
Federal Center of Technological Education in Rio de Janeiro
raaguiar@cefet-rj.br

Rodinei Medeiros Gomes, Dr
Mechanical Engineering Department
Federal University of Paraiba
gomes@lsr.ct.ufpb.br

Sandro Marden Torres, PhD
Materials Engineering Department
Federal University of Paraiba
sandro.marden@pq.cnpq.br