

7. Processing and properties of AA7075/porous SiO₂-MgO-Al₂O₃ composite

M.H. Robert, A.F. Jorge (Brazil)

16. Experimental study on mechanical properties of pumpkin tissue
- M. Shirmohammadi, P. Yarlagadda (Australia)

JAMME Materials

25. Low concentration magnetic nanoparticle and localized magnetic centers in different materials: studies by FMR/EPR method
- N. Guskos (Greece)

39. Mechanical properties of duplex steel welded joints in large-size constructions
- J. Nowacki, P. Zajęc (Poland)

49. Nanocrystalline copper based microcomposites
- J.P. Stobrawa, Z.M. Rdzawski, W. Gluchowski, J. Domagała-Dubiel (Poland)

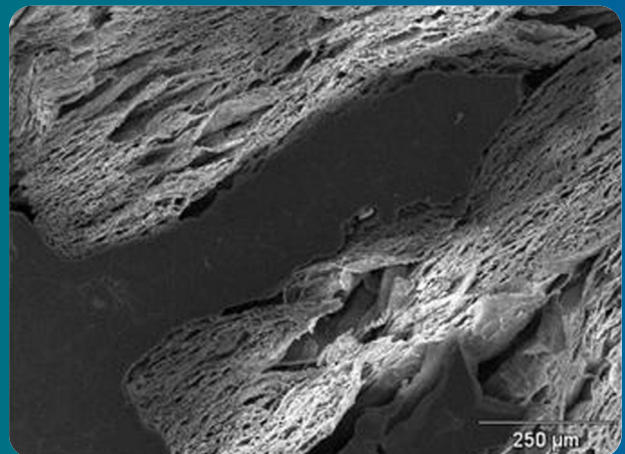
JAMME Properties

58. Untypical bromine corrosion in boilers co-firing biomass
- A. Hernas, B. Chmiela, B. Szczucka-Lasota (Poland)

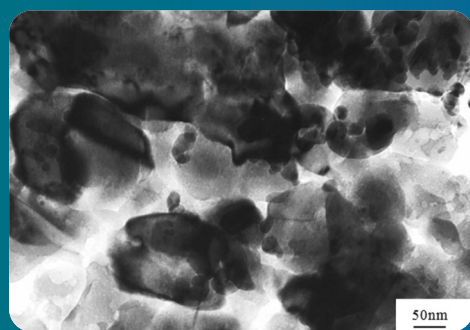
67. Assessment of loss in life time of the primary steam pipeline material after long-term service under creep conditions
- A. Zieliński, J. Dobrzański, T. Józwiak (Poland)

JAMME Analysis and modelling

75. Formulating of reverse task of chosen class of mechatronic systems
- A. Buchacz (Poland)

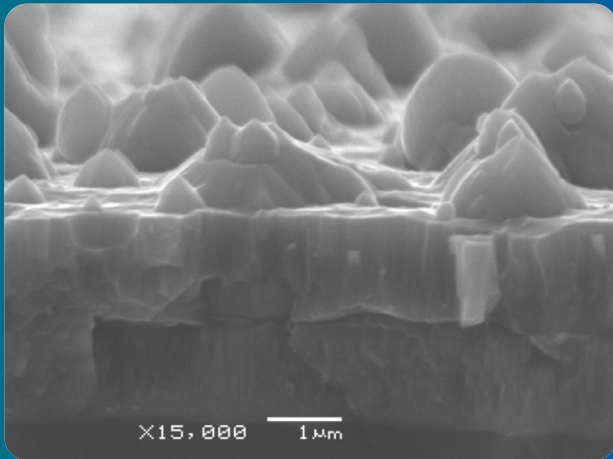


7 The research paper entitled "Processing and properties of AA7075/porous SiO₂-MgO-Al₂O₃ composite" by M.H. Robert and A.F. Jorge on a **page 7** presents a new composite based in Al matrix reinforced with porous, lightweight and low cost SiO₂/MgO/Al₂O₃ ceramic particles. The new material can present a unique combination of properties: those related to metal/ceramic composites and still associating some characteristics of cellular materials, as the low density and high plastic deformation under compression stresses. Concerning the production method, thixoinfiltration is a feasible processing route, with no difficult control of parameters and does not rely on specific and onerous equipment. Moreover, it is flexible to different alloys. Concerning the product, low density composites can be produced with good dispersion of reinforcement and reliable internal quality; this material presents a plateau of plastic deformation at low stresses under compression, signaling a potential application as energy absorbers. Theoretical simulations show also good thermal insulation ability. Both the processing route and the material produced – a low density metal/ceramic composite, using porous ceramic particulates as reinforcement, are new concepts under the development by the proposing group at FEM/UNICAMP. The thixoinfiltration can represent an alternative, low cost processing route for low density composites. The new presented composites are low weight and low cost material, presenting a unique combination of properties which can bring a whole new application field, as low cost, low density components for energy absorption and thermal insulation.



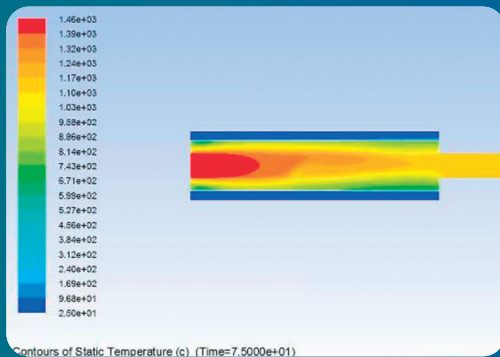
49

The paper from Materials area made by J.P. Stobrawa, Z.M. Rdzawski, W. Gluchowski and J. Domagała-Dubiel on "Nanocrystalline copper based microcomposites" on a **page 49** informs about microstructure, mechanical properties and deformation behaviour of copper microcomposites: Cu- Y₂O₃, Cu- ZrO₂ and Cu-WC produced by powder metallurgy techniques. A growing trend to use new copper based microcomposites is observed recently world-wide. Within this group of materials particular attention is put to those with nanometric grain size of a copper matrix, which show higher mechanical properties than microcrystalline copper. It was found out that addition of up to 2 wt % of a strengthening phase significantly improves mechanical properties of the material and increases its softening point. The obtained strengthening effect have been discussed based on the existing theories related to strengthening of nanocrystalline materials. The studies have shown importance of "flows" existing in the consolidated materials and sintered materials in pores or regions of poor powder particle connection which significantly deteriorate the mechanical properties of micro-composites produced by powder metallurgy. The paper contributes to the knowledge of mechanical properties and the nanostructure stability of Cu-Y₂O₃, Cu-ZrO₂ and Cu-WC microcomposites. A controlled process of milling, compacting, sintering and cold deformation provides possibility to obtain nanocrystalline copper based materials with improved functional properties.



The Analysis and modelling section represented by J. Ratajski and Ł. Szparaga on "On transition functions and nonlinearity measures in gradient coatings" on a **page 83** presents the influence of the shape of transition functions between the single layers of multilayer coating on the final internal stresses states in the coating. Additionally, the degree of nonlinearity and asymmetry of postulated gradient layers was calculated. There are an infinite number of possible measures of heterogeneity and nonlinearity of the transition layers. Also there are infinitely many functions with the same measures of asymmetry and nonlinearity, but different mathematical forms, thus functions of the same measures value form a kind of class of abstraction. It is convenient to consider specific representatives of the given class and expand the obtained results to remaining representatives which is laborious and ambiguous task. New concepts of nonlinearity and asymmetry measurability of transition function were introduced. Using predefined measures the dependence between internal stresses fields in postulated class of gradient layers and values of nonlinearity and asymmetry were obtained. A class of monotonic and asymmetric transition functions, describing continuous physico-chemical material's parameters changes in each layer of K-layered coating was created. Also new measures of nonlinearity and asymmetry of transition function were introduced.

83



120

The Manufacturing and processing section represented by A. J. Szajnar, W. Sebzda, M. Stawarz and T. Wróbel on "Electromagnetic field impact on the structure of continuous casting of grey cast iron" on a **page 120** presents the influence of the electromagnetic on the structure of grey cast iron obtained in the continuous casting process. The grey cast iron ingots a continuous casting laboratory stand was used to investigations. The stand contains continuous casting mould with inductor of rotate electromagnetic field. The research includes also the metallographic researches on scanning electron microscope and investigations of usable properties i.e. measurements of hardness and machinability. The work presents method of unification of structure and properties, which are particularly important in continuous casting. Uniform morphology of flake graphite in structure of cast iron ingots for automobile industry is very important in viewpoint of machinability. The results of investigations and their analysis show possibility of unification of flake graphite morphology in cast iron structure, and distribution of hardness on cross-section of ingot and its machinability.

83. On transition functions and nonlinearity measures in gradient coatings

J. Ratajski, Ł. Szparaga (Poland)

93. Hybrid modelling methods in materials science — selected examples

W. Sitek, J. Trzaska (Poland)



Manufacturing
and processing

103. The development perspectives of Physical Vapour Deposition technologies

A.D. Dobrzańska-Danikiewicz (Poland)

110. Thixocasting and rheocasting technologies, improvements going on

M. Rosso (Italy)

120. Electromagnetic field impact on the structure of continuous casting of grey cast iron

J. Szajnar, W. Sebzda, M. Stawarz, T. Wróbel (Poland)

128. Effect of laser cutting parameters on surface quality of low carbon steel (S235)

M. Zaied (France), E. Bayraktar, D. Katundi (Tunisia), M. Boujellbene (France, Tunisia), I. Miraoui (Tunisia)

135. Author index

136. Keywords index

137. Publisher's notice

138. Editor's notice