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Materials

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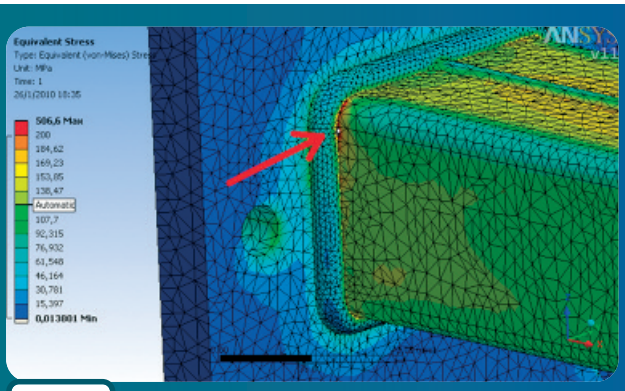
Analysis and modelling



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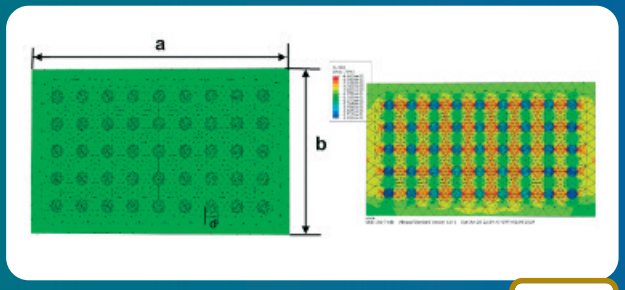
The paper written by K.C. Goes, G.F. Batalha, M.V. Pereira and A.F. Camarao on "Practical methodology to evaluate the fatigue life of seam welded joints" on a **page 35** discusses the practical and robust methodology developed to evaluate the fatigue life of seam welded joints under combined cyclic loading. Integrating fatigue analysis and finite elements, it is possible to analyse several welded joint configurations in the design phase, providing development time and cost reduction, increasing the project reliability. The finite element model was validated due to laboratory results. The analytical stress result presented upper value due to the approach used that considered the fillet weld supported all work. The model presented a good representation of failure and load correlation. This methodology will permit, in further studies, the modelling of both stresses, in-service and residual stresses, acting together, which seem like an advantage to engineers and researchers who work in design and evaluation of structural components against fatigue failures.



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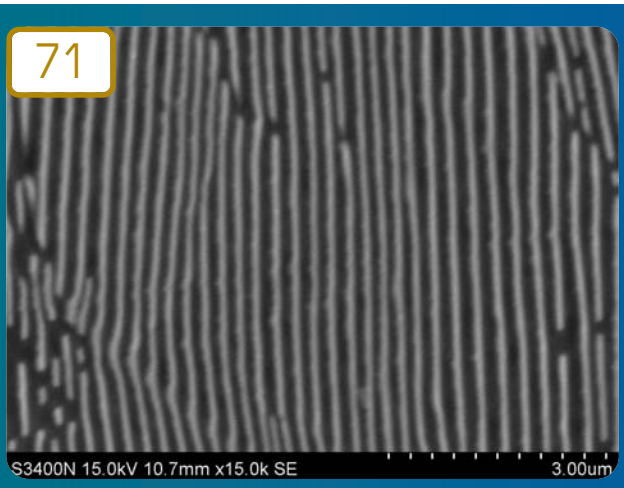
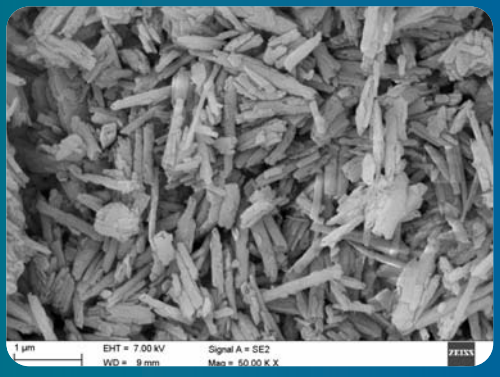
In the paper entitled "Damage analysis of the ceramic reinforced steel matrix composites sheets: experimental and numerical study" by E. Bayraktar, F. Ayari, D. Katundi, J.-P. Chevalier and F. Bonnet on a **page 53** damage analysis of TiB_2 (ceramic particles) reinforced steel matrix composite sheets is presented. This new steel composite receives much attention as potential structural materials due to their high specific strength and stiffness. The goal of the research described in this paper is to study the usage of this new steel family in the manufacture of light structures. The non homogeneity of the structure in this type of composites makes deeply complexity of their numerical and analytical modelling to predict their damage during the loading. For example, the interfaces essentially play a key role in determining mechanical and physical properties. For this reason, a Finite Element (FEM) analysis is used for modelling to simulate the macroscopic behaviour of this material, taking into account the relevant microscopic scales. The present research gives detail information on the new steel matrix composite sheets reinforced TiB_2 ceramic particles. This new composite was developed by ARCELOR research group and impact dynamic behaviour and weldability of the welded parts and base metals from this composite steel are discussed here in order to give practical and useful solution for industrial applications.



Authors: J. Herian and K. Aniołek in the paper entitled "Modelling of structure and properties of pearlitic steel and abrasive wear of the turnout frog in the cyclic loading conditions" on a **page 71** discuss the analysis of pearlite morphology changes as a result of hot rolling process and isothermal annealing. In physical modelling of tests of resistance to abrasive wear for the steel grade R260 after hot rolling and isothermal annealing it has been proved that this feature is a function of the steel structure and properties in the given operation conditions. The resistance to abrasive wear of steel R260 with a pearlitic structure and different pearlite morphology decreases with the increase of load and slide. It results from conducted numerical calculations that the biggest dynamic load is in the moment of a drive of a wheel set on a frog of the turnout. The value of the vertical force depends on speed and mass of the railway vehicle. The obtained test results confirm that these methods can be effectively used in shaping the pearlitic structure and properties of the steel.



In the paper entitled "Manufacturing of EN AW6061 matrix composites reinforced by halloysite nanotubes" by L.A. Dobrzański, B. Tomiczek and M. Adamiak on a **page 82** the composite materials of aluminium alloy matrix, manufactured with the use of powder metallurgy technologies, including mechanicalmilling and hot extrusion and in determining the influence of the share of halloysite nanotubes – as the reinforcing phase on the structure and mechanical properties of fabricated composites is presented. It has been confirmed that halloysite nanotubes can be applied as a effective reinforcement in the aluminium matrix composites. High energy ball milling as a method of mechanical milling improves the distribution of the halloysite reinforcing particles throughout the aluminium matrix, simultaneously reducing the size of particles. The application of halloysite nanotubes as the reinforcing phase of metal composite materials is a novel assumption of the discussed work and an interesting challenge whereof realization would enable to use this mineral clay in an innovative and cost effective way. The apparent density changes versus milling time can be used to control the composite powders production by mechanical milling and the presence of halloysite reinforcements particles accelerates the mechanical milling process. Conducted research shows that applied technology of composite materials production allows to obtain very good microstructural characteristics.

Manufacturing and processing

Technical paper