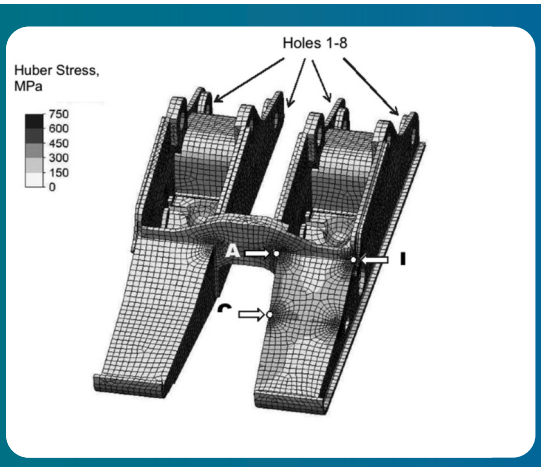
Analysis and modelling

Materials

Properties



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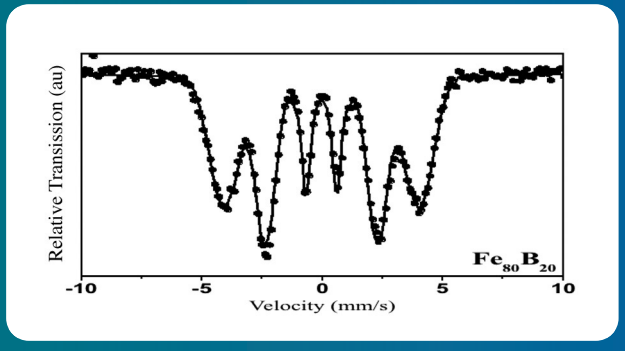
Authors: J. Okrajni, M. Plaza and M. Jaszczuk in the paper entitled "Deformation process of the material of mine powered roof supports in low-cycle fatigue conditions" on a **page 59** present the low-cycle fatigue process of mine powered roof supports working under mechanical high loading. The work focuses on the chosen component strain-stress characteristics. The issue of modelling the stress-strain behaviour of powered roof supports components during low-cycle fatigue has been discussed. In the examined devices, variable stress and strain values were calculated for a chosen characteristic load cycle. Diagrams in the form of a hysteresis loop determined using Neuber's hypothesis and FEM were compared. The values of the range of equivalent strain determined for multiaxial stress states using the finite element method proved to be close to those estimated via Neuber's method. The main value of this paper is the own method of the mechanical behaviour analysis of the powered roof support component. This method includes FEM modelling and Neuber's method of the stress-strain characteristics assessment. The material stress-strain behaviour has been treated as the local phenomenon that could be modelled. The method of stress-strain behaviour analysis used in the paper could be useful in the practical cases when the real components mechanical behaviour would be analysed and their fatigue life would be assessed.



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The paper written by R. Babilas, R. Nowosielski, M. Kądziołka-Gaweł and A. Zajączkowski on "Mössbauer investigations of amorphous Fe(80-x)B20Nbx (x=0,4,6,10) alloys" on a **page 66** discusses a structural and magnetic characterization of selected Fe-based metallic glasses in as-cast state. The XRD and Mössbauer spectroscopy investigations revealed that the studied alloys in as-cast state were amorphous. The solidus temperature assumed as the onset temperature of the melting peak on the DTA curve reached a value of 1405, 1394, 1392 and 1389 K for $Fe_{80}B_{20}$, $Fe_{76}B_{20}Nb_4$, $Fe_{74}B_{20}Nb_6$ and $Fe_{70}B_{20}Nb_{10}$ alloy, adequately. The Mössbauer spectra presented broadened six line patterns characteristic to the structural disorder of amorphous ferromagnetic materials. The changing of the average hyperfine magnetic field with niobium addition is connected with structural changing. A high concentration of Nb atoms with high atomic radius can act as diffusion barrier what leads to formation of regions rich in iron or boron atoms. The niobium addition in $Fe_{(80-x)}B_{20}Nb_x$ alloy improves soft magnetic properties in as-cast state. The Mössbauer spectroscopy is very useful method in studying the structural environment of Fe atoms on a nearest-neighbor length scale allowing the analysis of iron-containing phases. The obtained examination results confirm the utility of investigation methods in an analysis of microstructure of ferromagnetic glassy alloys.

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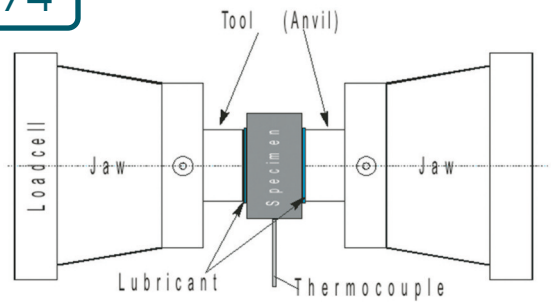
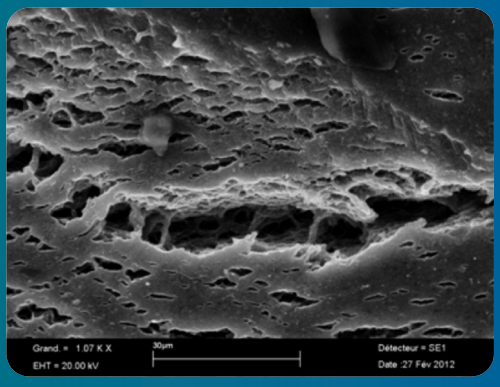


Authors: A. Nowotnik, P. Pędrak, J. Sieniawski and M. Góral in the paper entitled "Mechanical properties of hot deformed Inconel 718 and X750" on a **page 74** present how the results of high-temperature deformation of the examined Inconel alloys may possibly find some practical use in the workshop practice to predict flow stress values, but only within particular temperature and strain rate ranges. Variations of a flow stress vs. true strain illustrate behaviour of material during plastic deformation. Stress-strain relationship is generally evaluated by a torsion, compression and tensile tests. Compression tests were carried out on precipitations hardenable nickel based superalloys of Inconel 718 and X750 at constant true strain rates of 10^{-4}, $4x10^{-4}s^{-1}$ within temperature through which precipitation hardening phases process occurred (720-1150°C) using thermomechanical simulator Gleeble and dilatometer Baehr 850D/L equipped with compression unit. True stress-true strain curves analysis of hot deformed alloys were described. On the basis of received flow stress values activation energy of a high-temperature deformation process was estimated. Mathematical dependences (σ_{pl} -T i σ_{pl} - ϵ) and compression data were used to determine material's constants. These constants allow to derive a formula that describes the relationship between strain rate (ϵ), deformation temperature (T) and flow stress σ_{pl}.



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The Properties section represented by D. Zaimova, E. Bayraktar, D. Katundi and N. Dishovsky on "Elastomeric matrix composites: effect of processing conditions on the physical, mechanical and viscoelastic properties" on a **page 81** presents the processing, physical, mechanical and viscoelastic properties and chemical structure of the mixture of Natural rubber/Polybutadiene rubber (NR/BR) compounds. NR/BR based composites with different vulcanization temperatures and curing systems were characterized in respect of their curing characteristics (for 140°C and 160°C) and mechanical properties. The cure characteristics of the rubber compounds were studied by using the Monsanto MDR 2000 rheometer. The mechanical properties were investigated- tensile strength, elongation at break, tensile modulus at 100% (M100) and at 300% (M300) deformation. The hardness (Shore A) and molecular mass of the samples were also determined. Scanning electron microscopy was used to study the microstructure of the fracture surfaces. It was found out that with changing the vulcanization temperature from 140°C to 160°C decreasing in all mechanical properties (modulus M_{100} and M_{300}, tensile strength and elongation at break) is observed. This is probably due to the partial destruction of the crosslinks under the influence of the high temperature (160°C). Hardness is increasing with the increasing of the temperature. The temperature of vulcanization does not play a role for the dynamic mechanical properties (storage modulus and Tan Delta). As for the vulcanization system, modulus M_{100} and M_{300} increase with the passage from CV (compound D1) to EV (compound D2). Tensile strength and elongation at brake also increase. These results are not in accordance with the literature but can be explained by overcure of compound D1.

Manufacturing and processing