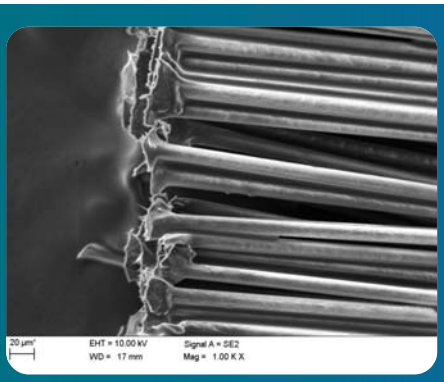
Contents

Research monograph

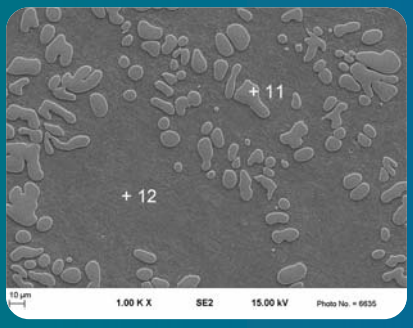
Materials

Properties



18

The paper entitled "The concept of preparation of oesophageal prosthesis based on long-fiber composite material" by L.A. Dobrzański, A.J. Nowak, W. Błażejewski and R. Rybczyński on a **page 18** demonstrates the possibilities of an application of long-fibrous composite material as a based material for prototype of oesophageal prosthesis (tubular element) with the use of so called arms, using coiling, plaiting and winding techniques. Authors worked out the prototype of internal oesophageal prosthesis (tubular element) with the use of so called arms, using coiling, plaiting and winding techniques. As a reinforcement, aramid fibres bound with different types of so called silicone rubbers were employed. Selection of winding parameters has been made in order to fabricate a prosthesis with appropriate mechanical parameters. Obtained samples were investigated in pressure tests. An applied original method of investigation shows useful operational feature that is work of single fibre bundles in matrix which undergo a deformation (but do not disturb the continuity of matrix) at the moment of local load and return to its original shape after load is removed. In the future researches authors are going to change the fabrication technology onto dry winding followed by closing obtained reinforcement in a mould and saturation with silicone to get better silicone content and connected with it better elasticity and tightness of the prosthesis.



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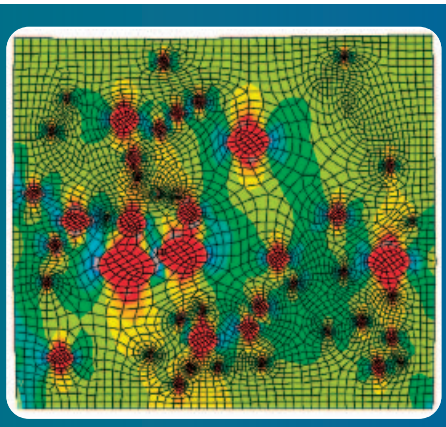
In the paper written by W. Głuchowski, J.P. Stobrawa, Z.M. Rdzawski, and K. Marszowski on "Microstructural characterization of high strength high conductivity Cu-Nb microcomposite wires" on a **page 40**, the investigation results of the properties and the microstructure of cold drown Cu-Nb composites are discussed. Research was aimed to investigate microstructure, mechanical and electrical properties of Cu-Nb15 wires. The investigated materials have been processed by vacuum furnace melting and casting, further hot forging and cold drawing. Alternatively material has been processed by one of the SPD (severe plastic deformation) method using oscillatory turning die pressing. Microstructure has been observed by optical and electron microscopy technics. Authors discuss also potential use of investigated materials as conductors in high field magnets. In the framework of results' discussion, ultimate tensile strength versus cold deformation degree have been presented. These changes have been discussed in relation to the microstructure evolution. It was stated that Cu-Nb alloys represent a promising material for production of coil wires for generators of strong magnetic fields. After the application of classical melting in vacuum furnace and cold plastic working wires of satisfactory mechanical properties (Rm over 900MPa) and high electrical conductivity (over 40MS/m) can be produced. To reach better uniformity of microstructure intensification of the processing can be considered, for example by extrusion of wire bundle by the press with reversibly rotating die (KOBO). Authors propose multiple drawing of Nb wire bundle in copper jacket as a promising method for production of Cu-Nb microcomposites. The number of wires which increases in geometric progression during subsequent bundling and accompanying reduction of Nb band cross-section provide possibilities for production of a microcomposite of homogenous microstructure and with Nb microbands evenly distributed in pure copper matrix.



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The paper entitled "Mechanical Analysis and Numerical Simulation of Modified Bone Cements in the Hip Joint Alloplasty" by J. Nowacki and A. Sajek on a **page 57** demonstrates the verification of the stress values in bone-cement-implant system during human movement cycle and determining the amount of bone cement admixture which induces a drop in mechanical properties to an acceptable level. In the first place, mechanical tests of modified cements were carried out. These tests are a basis for mathematical description of mechanical properties which will be used during numerical simulations. Numerical simulations were carried out using the geometry obtained by computer tomography. A drop in mechanical properties induced by modification depends on admixture size. During movement, cement bond is affected by considerable forces. These forces operate cyclically, i.e. momentarily (when setting a foot on the ground) within the elastic range of examined material. From the point of view of mechanical parameters, an optimum admixture of the aqueous solution of biologically active modifying agent is that inducing porosity at a level of 8%. Modifying agent amount was determined and verified that does not induce a decrease in the bending strength and the longitudinal modulus of elasticity during bending below the level specified in ISO 5833 standard.

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The Manufacturing and processing area section represented by M. Richert and B.Leszczyńska-Madej on "Effect of the annealing on the microstructure of HVOF deposited coatings" on a **page 95** presents how process of the coatings annealing deposited by high velocity oxy – fuel (HVOF) method influence on the microstructure changes. The differences in the microstructure and microhardness after different variants of the annealing in the comparison to the HVOF deposited coats were presented. The microstructure of the WC – Co and Cr_3C_2 – NiCr coatings was build from the equiaxial grains distributed relatively uniform. Also characteristic was large number of discontinuous, voids and pores, especially in the WC – Co coat. After annealing, both WC – Co and Cr_3C_2 – NiCr coating, the microstructure was more homogenous. It was observed reduction of the pore and voids amount. The microhardness after annealing was almost at the same level as after HVOF deposition. Two different coatings: WC – Co and Cr_3C_2 – NiCr deposited on the AK9 substrate by HVOF method were investigated. The coats were annealing at the nitrogen in the conditions as follows: a) T = 550°C, t = 5,5h, b) T = 500°C, t = 24h. After, the samples were subjected by using optical (MO) and scanning electron microscopy (SEM). Also the microhardness was determined by Vickers method, the applied load was 200gram. The performed investigations could be useful in the industrial practice and give the information about working WC – Co and Cr_3C_2 – NiCr coats at the elevated temperatures. The HVOF deposited and successive annealed WC – Co and Cr_3C_2 – NiCr coats have more uniform microstructure which could contribute to the improvements of some properties, for example wear resistance.

Analysis and modelling

Manufacturing and processing