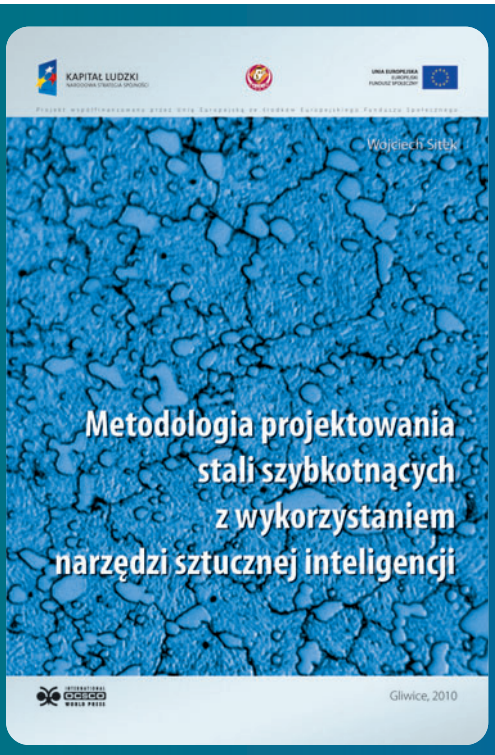
Research monograph

Materials

Analysis and modelling



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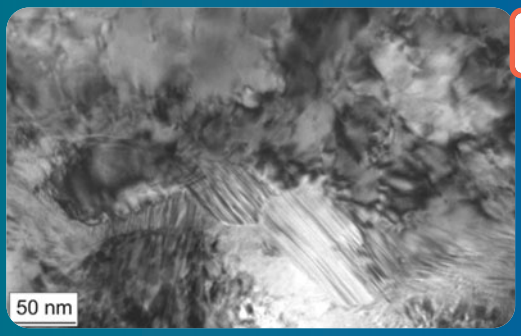
The Research monograph entitled "Methodology of high-speed steels design using the artificial intelligence tools" by W. Sitek on a **page 115** demonstrates the design methodology for the new high-speed steels with the required properties, including hardness and fracture toughness, as the main properties guaranteeing the high durability and quality of tools made from them. It was decided that hardness and fracture toughness K_{Ic} are the criteria used during the high-speed steels design. Solutions presented in the work, based on using the adequate material models may feature an interesting alternative in designing of the new materials with the required properties. The practical aspect has to be noted, resulting from the developed models, which may successfully replace the above mentioned technological investigations, consisting in one time selection of the chemical composition and heat treatment parameters and experimental verification of the newly developed materials to check its properties meet the requirements. The presented approach to new materials design, being the new materials design philosophy, assumes the maximum possible limitation of carrying out the indispensable experiments, to take advantage of the existing experimental knowledge resources in the form of databases and most effective computer science tools, including neural networks and evolutionary algorithms. It should be indicated that the materials science knowledge, pertaining oftentimes to the multi-aspect classic problems and described, or – rather – saved in the existing, broadly speaking, databases, features the invaluable source of information which may be used for discovery of the unknown so far relationships describing the material structure – properties relations.

Appendix
The integral part of this Issue is monograph publication in Polish of Dr W. Sitek entitled: „Metodologia projektowania stali szybkotnących z wykorzystaniem narzędzi sztucznej inteligencji"

Selected materialographical photo



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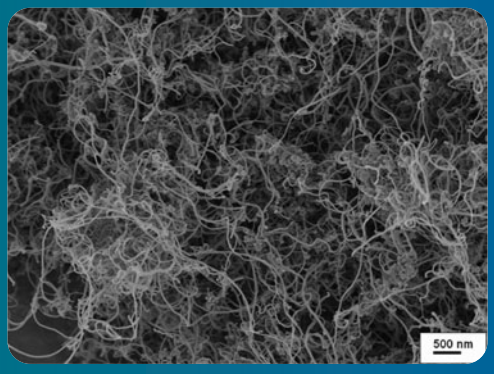
The Materials section represented by M. Richert, J. Richert, B. Leszczyńska-Madej, A. Hotloś, M. Maślanka, W. Pachla and J. Skiba on "AgSnBi powder consolidated by composite mode of deformation" on a **page 161** presents the characterisation of microstructure and properties of consolidated powder AgSn7.5Bi0.5 by using composition of cyclic extrusion compression (CEC) and hydrostatic extrusion (HE) methods. The investigated samples contained consolidated by large plastic deformations particles of AgSnBi. The samples were deformed by the CEC method in the range of true strains ϕ = 0.32 up to ϕ = 25.2 and then additionally were extruded to ϕ = 1.85. The systematic observations by optical microscopy were performed for determination of the quality of particle joints. The microstructure was observed by optical, scanning and transmission electron microscopy. As the final product the wires of 3 mm in diameter were obtained. The microstructure and microhardness of wires were investigated. The comparison of powder properties after CEC deformation and after the combined deformation CEC and HE is presented. The performed investigations provide information, which could be useful in the industrial practice for production of new materials for electrical contacts. It was assumed that mechanical consolidation of AgSnBi powder consisting from CEC and HE can form wires of bulk material with the properties comparable to materials for electrical contacts now producing by sintering.



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Authors: L.A. Dobrzański, M. Pawlyta, A. Krztoń, B. Liszka and K. Labisz in the paper entitled "Synthesis and characterisation of carbon nanotubes decorated with platinum nanoparticles" on a **page 184** discuss results of synthesis of carbon nanotubes decorated with platinum nanoparticles by organic colloidal process as an example of direct formation of nanoparticles onto CNTs. CNT were grown by chemical vapour deposition (CVD) by the catalytic decomposition of CO. To improve metal deposition onto CNTs the purification procedure with a mixture of concentrated HNO_3–H_2SO_4 and H_2O_2 reduction reagent was applied. CNT–nanocrystal composite was fabricated by direct deposition of nanoparticles onto the surface of CNTs. Chemical composition and crystallographic structure of the obtained Pt/CNT composites were confirmed by energy dispersive X-ray spectroscopy (EDS) and by X-ray diffraction (XRD) measurements, while transmission (TEM) and scanning electron microscopy (SEM) were used for characterisation of the morphology of composite as well as the distribution of nanocrystals on the CNTs surfaces. Obtained material can be employed in constructing various electrochemical sensors. As a result of increasing of the surface area of Pt caused by the reduction of the size of used particles, fabricated sensor may be characterised by higher sensitivity.