Contents

Materials

7. Influence of pulse laser irradiation on structure and mechanical properties of amorphous $Fe_{73.1}Nb_3Cu_{1.0}Si_{15.5}B_{7.4}$ alloy

S.I. Mudry, Yu.S. Nykyruy, Yu.O. Kulyk, Z.A. Stotsko (Ukraine)

Properties

12. Microstructure investigations of cast Zn-Al alloys

B. Krupińska, Z. Rdzawski, M. Krupiński, K. Labisz (Poland)

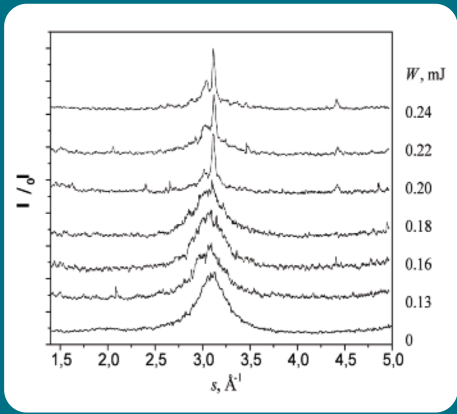
20. Properties ribbon amorphous $Fe_{73}Ti_5Y_3B_{19}$ and $Fe_{73}Co_5Y_3B_{19}$ produced by melt-spinning

K. Zdrodowska, P. Kwarciak, M. Szota, M. Nabiałek (Poland)

Manufacturing and processing

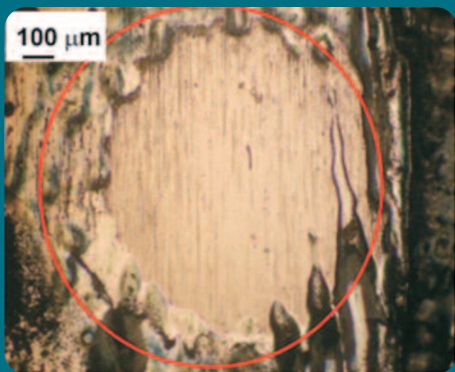
29. Non-destructive methods of quality assessment of permanent joints of polymer materials

M. Szymiczek, Ł. Wierzbicki (Poland)



7

Authors: S.I. Mudry, Yu.S. Nykyruy, Yu.O. Kulyk and Z.A. Stotsko in the paper entitled "Influence of pulse laser irradiation on structure and mechanical properties of amorphous $Fe_{73.1}Nb_3Cu_{1.0}Si_{15.5}B_{7.4}$ alloy" on a **page 7** discuss the structure changes in Fe-based amorphous ribbon under laser radiation, determine dependence from laser treatment parameters and establish the correlation between structure and microhardness. Amorphous ribbons of $Fe_{73.1}Nb_3Cu_{1.0}Si_{15.5}B_{7.4}$ alloy, obtained by rapid cooling from the melt, has been treated by pulsed laser radiation with wavelength λ = 1.06 µm and pulse duration τ = 130 ns. Structure transformation has been studied by means of X-ray diffraction method, which allowed to determine the phase composition, volume fraction and grain size of crystalline phases has been determined. It has been shown that laser treatment method allows forming an amorphous-nanocrystalline composite. It was found out that microhardness of ribbon increases after irradiation and linearly depends on percent of crystalline phase. Laser treatment can be used as an substitute of isothermal heat treatment to produce amorphous-nanocrystalline materials with improved properties. The originality of this work is based on applying of pulse laser irradiation for modifying structure of amorphous $Fe_{73.1}Nb_3Cu_{1.0}Si_{15.5}B_{7.4}$ alloy.

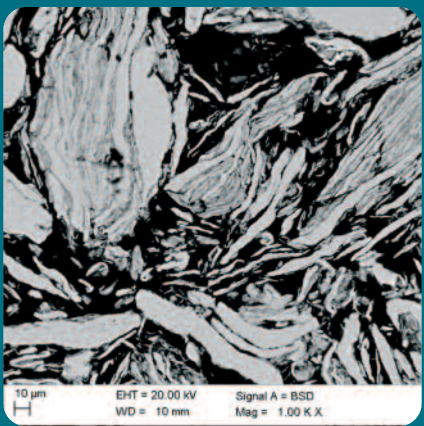


20

The research paper entitled "Properties ribbon amorphous $Fe_{73}Ti_5Y_3B_{19}$ and $Fe_{73}Co_5Y_3B_{19}$ produced by melt-spinning" by K. Zdrodowska, P. Kwarciak, M. Szota and M. Nabiałek on a **page 20** presents the mechanical properties of $Fe_{73}Ti_5Y_3B_{19}$, and $Fe_{73}Co_5Y_3B_{19}$ alloys and carry out the comparative examination of the bright side of those alloys. $Fe_{73}Ti_5Y_3B_{19}$, Fe73Co5Y3B19 alloys were produced by the melt-spinning method. That method involves rapid cooling of the metal on a spinning copper cylinder. The cooling rate required for obtaining the amorphous alloy ranges from 10^5 to 10^6 K/s. The above mentioned method is popular and often used; however, in order to obtain alloys of amorphous structure, it should be assured that the conditions for obtaining amorphous materials, as a set by A. Inoe, are satisfied. The amorphous $Fe_{73}Ti_5Y_3B_{19}$, $Fe_{73}Co_5Y_3B_{19}$ alloys find the application in the power industry, where there are used for transformer cores. Mechanical properties, such as microhardness, roughness, abrasive wear with the use of a ball tester, have been described and the X-ray diffraction has been determined in the paper.

29

The paper from Manufacturing and processing area made by M. Szymiczek and Ł. Wierzbicki on "Non-destructive methods of quality assessment of permanent joints of polymer materials" on a **page 29** describes the verification of usefulness of selected non-destructive testing methods as a tool of assessment of permanent joints of elements with variable thickness and geometry. The research was conducted with the use of samples prepared from the components used for strengthening the car seats. The elements were made from low-density polyethylene, applying the injection technology, and then butt welded. The quality assessment was conducted with the use of selected non-destructive methods – visual, thermal imaging, shearography inspection and 3D scanning. In order to verify the quality of the welds, tensile strength tests were conducted. The work presents the innovative application of spatial scanning 3D for the assessment of flash geometry achieved as the result of butt welding. The research conducted will indicate, within the researched scope, the method, which allows for the identification of flaws of permanent joints. The application of non-destructive methods of quality assessment, particularly spatial scanning, allows for the assessment of quality and exact dimensioning of flash both from outside (visible) and outside of the element.



39

The research paper entitled "Composite materials based on AlMg1SiCu aluminium alloy reinforced with halloysite particles" by B. Tomiczek and L.A. Dobrzański on a **page 39** shows the microstructure and technological, as well as mechanical properties of AlMg1SiCu matrix composite materials reinforced with halloysite particles by powder metallurgy techniques and hot extrusion. Structure of newly developed composite materials reinforced with halloysite nanotubes proves that a mechanical milling process allows to improve the arrangement of reinforcing particles in the matrix material. A homogenous structure with uniformly arranged reinforcing particles can be achieved by employing reinforcement with halloysite nanotubes if short time of milling is maintained thus eliminating an issue of their agglomeration. Strong plastic deformations and fine grain size and the dispersion of halloysite reinforcing particles caused by mechanical milling is substantially reinforcing the composite materials reinforced with halloysite nanotubes as expressed with nearly a threefold increase in the hardness of composite powders as compared to the value of this quantity before milling. As the fraction of halloysite nanotubes is growing to 15%, structural changes in the powders of composite materials subjected to mechanical milling are reaching the set condition 3 times faster as compared to the matrix material. It has been confirmed that halloysite nanotubes can be applied as an effective reinforcement in the aluminium matrix composites. Deformation, grain size reduction and dispersion conduce to strengthening of the composite powders.

JAMME

Manufacturing and processing

39. Composite materials based on AlMg1SiCu aluminium alloy reinforced with halloysite particles
B. Tomiczek, L.A. Dobrzański (Poland)

47. Author index

48. Keywords index

49. Publisher's notice

50. Editor's notice