POLITECHNIKA ŚLĄSKA W GLIWICACH

Wydział Mechaniczny Technologiczny

mgr inż. Anna Januszka

PRACA DOKTORSKA

Identyfikacja procesu krzepnięcia masywnego szkła metalicznego $Fe_{36}Co_{36}B_{19,2}Si_{4,8}Nb_4$

Promotor:

Prof. dr hab. inż. Ryszard Nowosielski

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Abstract

„Identification of solidification process of $Fe_{36}Co_{36}B_{19,2}Si_{4,8}Nb_4$ bulk metallic glass"

PhD thesis concern on fabrication of bulk metallic glasses by pressure die mould casting. On the base of preliminary study the purpose of PhD thesis, which was identification of metallic glasses solidification process for $Fe_{36}Co_{36}B_{19,2}Si_{4,8}Nb_4$, was formulated. Therefore, the numerical model of temperature distribution in a metal form and a solidifying sample was formulated. Additionally, stresses distribution and partially model verification were realized. In order to realization of thesis purpose, numbers of investigations were carried out. An amorphous structure of prepared samples was confirmed by X-ray analysis and microscope observations. For numerical model formulation DTA, DSC, thermal conductivity, thermal expansion and specific heat examination were realized. Research program include also density and mechanical properties (microhardness, compressive strength) tests.

Fabrication of bulk metallic glasses requires a cooling rate in the range of 10^3 K/s. The state of amorphous structure is probably depended on the rate of cooling. On the base of the above statement thesis of dissertation was formulated: distribution of glass temperature transition in sample volume is change in time and space. It is related with different cooling rate in cross section of sample and took effect in structure diversification and changes of residual stresses.

The examinations, which were realized, allows proving thesis of dissertation and caused to make decision about future work on presented research problem.

Keywords: identification process, bulk metallic glasses, critical cooling rate, Finite Element Method, residual stresses.