Alex Guskov, J Material Sci Eng 2017, 6:1 (Suppl)
http://dx.doi.org/10.4172/2169-0022.C1.057

7th Annual Congress on
Materials Research and Technology
February 20-21, 2017 Berlin, Germany

Alex Guskov

Institute of Solid State Physics of RAS, Russia

The decomposition of the solution during the formation of eutectic composites

Motivation Research: Explanation and prediction of the distribution of components in the crystallization solutions causes great difficulties. One reason for this is the assumption that during crystallization the solution is in the metastable state. The decomposition of the solution occurs by binodal scenario in this case.

Aim: The purpose of this study is to show that in many cases the solution during crystallization is in an unstable state. The unstable condition leads to decomposition of the solution by spinodal scenario.

Methodology & Theoretical Orientation: Experimental demonstration of spinodal decomposition of the solution is conducted by means of video shooting. Locally configuration thermodynamic model is used to explain the state changes of the solution during the phase transition. This model allowed adding additional coordinate - mixing energy in the equilibrium phase diagram. Boundary of the spinodal area of the solution is built into the new coordinates. Spinodal defines curve the dynamic equilibrium that must be considered in the calculations of the processes of interphase mass transfer.

Findings: The possibility of spinodal decomposition of the solution during its crystallization significantly alters the representation of interphase mass transfer. Many cases of the redistribution component during the phase transition cannot be explained without taking into account of spinodal decomposition.

Conclusion & Significance: Spinodal decomposition of the solution explains the process of formation of a periodic distribution of the eutectic composites. The layer of the unstable solution is localized in front of the unstable interface. The unstable solution decomposes into phases have a composition close to the eutectic composition of the solid phases. The period of alternation of these phases is set by the period of instability of the interface. Experiments show that the formation of dendrites in the two-phase zone and extremum of the component concentration close to interface also occurs in the spinodal decomposition scenario.

Biography

Alex Guskov completed his PhD in 1982 at Physical Institute of Russian Academy of Sciences. He worked at Institute of Solid State Physics, Russian Academy of Sciences and investigated the influence of interaction of laser radiation and a solid. Simultaneously, he was engaged in application of technological processes in manufacture of electronic devices. Now his research interest focuses on “Heat mass transfer during the phase transition”.

guskov@issp.ac.ru

Notes: