PHASE TRANSITION AT THE TIN-GERMANIUM INTERPHASE BOUNDARIES

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The occurrence of phase transitions at the boundaries has long been discussed in the literature dealing with grain boundaries and interphase boundaries in solids. There are, however, few works whose results may be interpreted as manifestations of phase transitions at the interfaces.

We have studied the properties of tin-germanium <001> twist interphase boundaries with different misorientation angles near the temperature of the βSn - γSn phase transformation in the bulk and at the boundaries is determined from the jumps of the bulk-and boundary-diffusion coefficients of indium.

The βSn - γSn phase transition temperature at the boundaries is found to be different from that in the bulk of tin, the difference amounting to 15°C. The phase transformation temperature at the boundaries does not exceed that in the bulk of tin.

The boundaries studied comprised both special, with low surface tension, and conventional boundaries, exhibiting high surface tension[1,2]. It appeared that the higher the boundary surface tension, the lower is the temperature of the boundary phase transition.

It has also been found that in the temperature interval which is 3 to 5°C lower/higher than the phase transition point one can observe the critical behaviour of the coefficients of the bulk and/ or boundary diffusion, that is, as the phase transformation point is being approached from the high-temperature side, the diffusion coefficients decrease anomalously, whereas they increase anomalously as this point is being appreached from the low-temperature side. During this event the jump of the boundary diffusion reaches three orders of magnitude. We have been able to determine the critical values of the boundary diffusion coefficients of indium for the increasing and decreasing branches.

So, it has been shown for the first time that the "bulk" phase transition can take place at the boundary at a different temperature, the temperature of this transition being dependent on the boundary paramet-

ers. The measurement of the critical values near the boundary phase transitions can yield a fine infarmation on the "energy" structure of the boundary.

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In the last decade the scientific community has shown a great renewal of interest in the study of phenomena on solid surfaces. Developments in recent years have improved the level of understanding of solid surfaces, in terms of the detailed knowledge of electronic properties, surface crystalography, dynamics of gas-solid interactions, transport properties of both clean surfaces and surfaces with adsorbed species.

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