THE CALCULATION OF ABSORPTION COEFFICIENT OF $InSb_{1-x}Bi_x$ SOLID SOLUTIONS

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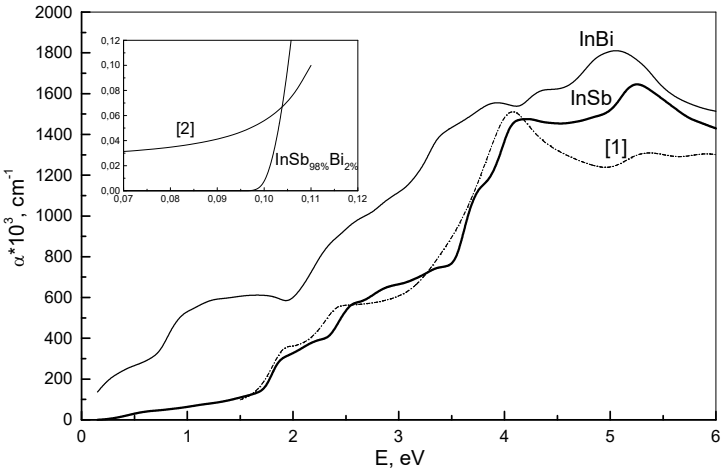
Narrow-gap solid solutions on the base of $A^{III}B^{V}$ semiconductors are perspective materials for solid state electronics (creation of infrared detectors, low-noise filters for communication systems and lasers with smooth reconstruction of length width). Traditional solutions on the base of $A^{III}B^{V}$ semiconductors do not give the possibility to increase wave length range more than 7,5 μm. Creation of photoelectronic devices in far infrared region requires synthesis of new solutions or strained heterostructures. $InSb_{1-x}Bi_x$ crystals with zink-blende structure are the solutions with expected properties and we investigate them in present paper.

Using local empirical pseudopotential with spin-orbit interaction taking into account the electron band structure of $InSb_{1-x}Bi_x$ in virtual crystal approximation is calculated. For binary compounds InSb and InBi characteristic gaps between energy bands in high symmetry points of Brillouin zone satisfactorily coincide with known experimental results. Temperature dependencies were calculated with the use of Brooks-Yu method. Satisfactory coincidence of the band structure of $InSb_{1-x}Bi_x$, temperature and concentration with an experiment let us to investigate ε_1 and ε_2 dielectrical functions taking into consideration the temperature using integral equations of Kramers-Kronig. Having used them we also calculated an absorption coefficient α as for binary compounds InSb and InBi as for the triple alloy $InSb_{1-x}Bi_x$. These results well correlate with experimental ones in the area of the fundamental absorption.



[1] Aspnes D.E., Studna A.A. Phys. Rev. B., **27,** 985 (1983).
[2] A.M. Jean-Louis, B. Ayrault, J.Vargas. Phys. Stat. Sol., **34**, 341 (1969).