J Material Sci Eng 2013, 2:4
http://dx.doi.org/10.4172/2169-0022.S1.012

OMICS Group Conferences
Accelerating Scientific Discovery

2nd International Conference and Exhibition on
Materials Science & Engineering

October 07-09, 2013 Hampton Inn Tropicana, Las Vegas, NV, USA

Physical-mechanical characteristics of monocrystalline $Si_{1-x}Ge_x$ ($x \leq 0,02$) solid solutions

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Si-Ge solid solutions (bulk poly-and monocrystalline samples, thin films) are characterized by high perspectives for application in semiconductor devices, in particular, optoelectronics and microelectronics. In this light complex, studying of structural state of the defects and structural-sensitive physical properties of Si-Ge solid solutions depending on the contents of Si and Ge components is very important. Present work deals with the investigations of microstructure, electrophysical characteristics, microhardness, internal friction and shear modulus of $Si_{1-x}Ge_x$ ($x \leq 0,02$) bulk monocrystals conducted at room temperatures. Si-Ge bulk crystals were obtained by Czochralski method in [111] crystallographic direction. Investigated monocrystalline $Si_{0,995}Ge_{0,005}$, $Si_{0,99}Ge_{0,01}$ and $Si_{0,98}Ge_{0,02}$ samples are characterized by p-type conductivity and carriers concentration is 5.10^{14}-$1.10^{15}cm^{-3}$, dislocation density is 5.10^3-1.10^4cm^{-2}, microhardness according to Vickers method is 900-1200 kg/mm^2, and shear modulus is 4100-4300 kg/mm^2.

Investigated samples are characterized with 0.5x0.5x (10-15) mm^3 sizes, oriented along [111] direction at torsion oscillations ≈1 Hz, multistage changing of internal friction and shear modulus has been revealed in an interval of strain amplitude of 10^{-5}-10^{-3}. Critical values of strain amplitude have been determined at which hysteretic changes of inelastic characteristics and microplasticity are observed.

The critical strain amplitude and elasticity limit values are also determined. Tendency to decrease dynamic mechanical characteristics is shown with increasing Ge content in Si-Ge solid solutions. Observed changes are discussed from the point of view of interaction of various dislocations with point defects and their complexes in a real structure of Si-Ge solid solutions.

Biography

I. R. Kurashvili has completed her Ph.D. at the age of 28 years from Georgian Technical University. She is senior scientific worker of Sukhumi Institute of Physics and Technologies (Georgia, Tbilisi). She has published more than 25 papers in reputed journals.

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Potential of pure LiF phosphors as dosimetry material: Thermoluminescence studies ranging from threshold to high gamma exposure

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Pure lithium fluoride (LiF) phosphors have been synthesized by the chemical co-precipitation method at different pH values (7.0, 8.0, 9.0 and 10.00). The formation of the crystalline structure has been confirmed by X-ray diffraction, FESEM and TEM. Thermoluminescence (TL) properties of LiF phosphors irradiated with gamma rays at different doses of 10 Gy-70 kGy have been studied. The analysis of TL glow curve revealed the existence of three well resolved glow peaks, first low temperature peak at around 82°C, second (major peak) at 125°C and third one at higher temperature around 303°C. The LiF crystallites synthesized at pH 8.00 with maximum TL sensitivity at studied gamma doses ranging from threshold to high exposures are potential candidate for dosimetry applications. TL-kinetics studies of LiF phosphors synthesized at pH 8.00 have also been done. The major peak in the TL glow curve is almost resolved from other peaks, which has been analyzed using Chen's peak shape method to determine the TL kinetic parameters. TL intensity almost increases linearly with gamma dose, however TL glow curve shift slightly to lower temperature values as a function of gamma exposure.

Biography

Arvind Kumar, Associate Professor of Physics completed his Ph.D. from Panjab University, Chandigarh in the field of Gamma-Ray Spectroscopy and published 14 international papers. He is presently synthesizing and characterizing materials for dosimetric applications.

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