World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:13, No:10, 2019

Peculiarities of Internal Friction and Shear Modulus in 60Co γ-Rays Irradiated Monocrystalline SiGe Alloys

Authors : I. Kurashvili, G. Darsavelidze, T. Kimeridze, G. Chubinidze, I. Tabatadze

Abstract : At present, a number of modern semiconductor devices based on SiGe alloys have been created in which the latest achievements of high technologies are used. These devices might cause significant changes to networking, computing, and space technology. In the nearest future new materials based on SiGe will be able to restrict the A³B⁵ and Si technologies and firmly establish themselves in medium frequency electronics. Effective realization of these prospects requires the solution of prediction and controlling of structural state and dynamical physical –mechanical properties of new SiGe materials. Based on these circumstances, a complex investigation of structural defects and structural-sensitive dynamic mechanical characteristics of SiGe alloys under different external impacts (deformation, radiation, thermal cycling) acquires great importance. Internal friction (IF) and shear modulus temperature and amplitude dependences of the monocrystalline boron-doped Si_{1-x}Ge_x(x≤0.05) alloys grown by Czochralski technique is studied in initial and ⁶⁰Co gamma-irradiated states. In the initial samples, a set of dislocation origin relaxation processes and accompanying modulus defects are revealed in a temperature interval of 400-800 ^{0}C. It is shown that after gamma-irradiation intensity of relaxation internal friction in the vicinity of 280 ^{0}C increases and simultaneously activation parameters of high temperature relaxation processes reveal clear rising. It is proposed that these changes of dynamical mechanical characteristics might be caused by a decrease of the dislocation mobility in the Cottrell atmosphere enriched by the radiation defects.

Keywords : internal friction, shear modulus, gamma-irradiation, SiGe alloys
Conference Title : ICMSCMP 2019 : International Conference on Material Science and Condensed Matter Physics
Conference Location : Barcelona, Spain
Conference Dates : October 24-25, 2019