Inelastic Defect Characteristic Internal Friction in SiO_2, GeSi and Anisotropy Automated System "KERN-DP"

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Influence of direct and variable electrical current is considered at simultaneous act of ultrasonic deformation on internal friction (IF) and elastic module of GeSi single-crystal after cutting and polishing. The diminishing of elastic module E of and the growth of internal friction Q^{-1} is found out at achievement of critical value of electrical current. Kinetics of annealing of structural defects is studied.

The results of examinations of the relaxation processes in a crystalline lattice at thermal and ultrasonic (US) processing on the temperature spectrum of internal friction and elastic module (directional surface of inelastic-elastic body) of SiO_2, GeSi are presented. The growth of IF $Q^{-1}(\tilde{J})$ is observed for an alternating current $\tilde{J}$ at achievement of critical value of electrical current thickness $J^*_{cr} \approx 60 \cdot 10^3$ A/m^2 with the simultaneous diminishing of the elastic module value $E(\tilde{J})$ at the consequent increasing of current thickness, as evidently from fig. 1.

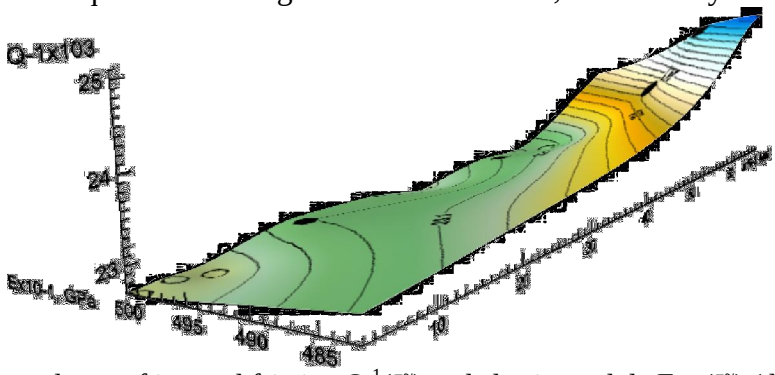

Fig. 1. Current dependence of internal friction $Q^{-1}(\tilde{J})$ and elastic module $E_{111}(\tilde{J})$ (directional surface inelastic-elastic body) of monocrystal GeSi after cutting and polishing from an alternating electrical current thickness with frequency $\omega_J = \omega_{US}$.

The software "KERN-DP" is developed for the automated system of anisotropy parameters analysis. The structure of database is developed on language of mySQL information, physical properties, the special procedures of data management are developed.

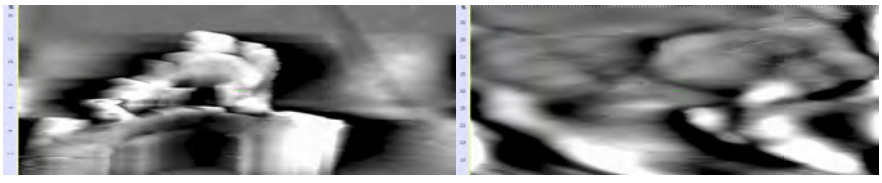

Fig. 2. Atomic force microscopy microstructure of SiO_2 pores on Si (100) ($15x15x10^3$ nm; $1x1x10^3$ nm).

Conclusions

1. The measuring of internal friction background Q^{-1}_0 after different heat, mechanical, radiation treatments gives information about the changing of the thermoelastic strains fields σ_i in SiO_2.

2. The dynamic characteristics of interstitial atoms Si_j, vacancy V and O-complexes can be applied for account of a condition of an annealing with the purpose of deriving specific structural defects in SiO_2.