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Abstract

INELASTIC ANISOTROPY OF RADIATION CROSS-LINKED HYDROGELS, POROUS SiO2, POROUS POLYSTYRENE AND AUTOMATED SYSTEM
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Bandages from the radiation cross-linked hydrogels for wounds for the grant of the urgent help at bleeding, burns contain antiseptic, anaesthetic, haemostatic. The automated system of ultrasound measuring of anisotropy parameters data of velocities of elastic longitudinal,"rapid" and "slow" transversal waves are tested.
Experiment
The ultrasound (US) computer device KERN-4 measuring of velocities is consist in measuring block and computer with operation system "Windows XP" are represented on fig. 1. The program KERN-4 ensures the management of measured block basic subsystems, the reflection of receiving signal in digital oscilloscope regime, which remember, and the calculation of ultrasound velocity and indication of its size on indicators. The measuring block is consist of generator, force magnifier, management-1 module, management-2 module, receiver, power module. The management block is consist of the generator created pair impulses selection scheme, which follow with clock rate, the standard and measuring impulses forming scheme and synchronization scheme of deflection. The frequency range f = 0,3÷2 MGz [1,2].

Fig. 1. The window illustration of data treatment of elastic waves velocities measuring by the echo-impulse method on frequency f ≈ 1,11 MGz, f ≈ 0,43 MGz and appearance of computer device KERN-4.

The front panel of control of setting of ALA-TOO device (IMASH-20-75), the atomic force microscope (AFM) microstructure of SiO2 pores on Si (100) are represented on fig. 2, fig. 3.

Fig. 2. Front panel of control of setting of ALA-TOO device (IMASH-20-75). 1 - the vacuum-gauge, 2 - organs of management and control of the power of mercury-quartz lamp DRSH-250 of microscope module, 3 – the thermopair switch, 4 – the clock, 5 - the annunciator panel, 6 – the microscope, 7 – the nest for connecting of electrode welding thermopair, 8 – the reflection device, 9 – the moving handle of protective glass.

Fig. 3. AFM microstructure of SiO2 pores on Si (100) (15x15x103 nm; 1x1x103 nm).
Results and discussion
The line relation between strain tensor σij and deformation for anisotropic environment is equal [1]:
. (1)
Movement equation for anisotropic environment is equal [1]:
. (2)
The displacement U on free surface of anisotropic heterogeneous environment is modeling by the system of homogeneous anisotropic layers with plane parallel boundaries. The every boundary is described by the elastic modules Ei and density ρi. The condition of hard contact is executed on the boundaries between layers. Integral coefficient of elastic anisotropy Aμ is equal [1]:
, (3)
where - acoustic tensor. The oscilloscopegramma of impulses with longitudinal polarization V[001] in SiO2 are
represented on fig. 4.

Fig. 4. Oscilogramma of impulses with longitudinal polarization V[001], which are reflected in SiO2.

The quasilongitudinal US velocity V⊠[001] = 5270 m/sec was determined from the oscilloscopegramma in fig. 2 elastic module = 75,26 GPa; “fast” quasitransversal ultrasonic (US) velocity V⊠[100] = 2740 m/sec, shear module = 18,84 GPa; after Puasson coefficient μ = 0,2996, Debye temperature θD = 267,0 K SiO2.
Conclusions
The optimum concentration C = 5% of polyvinyl alcohol (C2H4O)n radiation cross-linked hydrogel with the maximal absolute values of the elastic limit σE; static module E at compression, at extension; strength limit at compression σst in consequence of the formation of the polyvinyl alcohol molecules nanoclusters.

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