KEY ROLE AND THE UNIVERSALITY OF DEFORMATION MECHA-NISMS IN PHASE TRANSITIONS IN SOLIDS, LIQUIDS, BIOLOGICAL TISSUES (TUMOR GROWTH, AGING, ADAPTATION TO STRESS AND MEDICAL TREATMENT ARE INCLUDED)

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> The true, unique goal of science is the discovery of not the mechanism, but the unity... The question is not whether the nature is unique but in what way it is unique.
> *Anri Poincare, "Science and Hypothesis" (1902)*

Recent investigations irrefutably show that real crystals, glasses, melts, liquids, gases always contain nuclei and nanoclusters of various phases. The interface stresses due to structural and mechanical mismatch between phases play the key role in phase transiti-ons. The first important goal of this work (the request for the invention) is the universa-lity of the deformation and relaxation mechanisms (DRM) during phase transitions in solids, glasses, liquids, melts, gases and biological tissues [1]. This is confirmed by the correlation of transition parameters for various materials: shear moduli, viscosity, sur-face tension, activation energies of deformation and heat of phase transitions, hysteretic character of their variation, the influence of phase prehistory, the similar reactions to physical and chemical effects, the similarity of kinetic curves for crystallization from the melt or glass state, redox reactions, diffusion, electrical conductivity, electrochemical deposition, adsorption-desorption, martensitic and structural transformations, etc. [1]. Mechanical treatments of phase systems induce some of them to grow at the expense of the others up to chemical compounds forming (mechanical alloying, acoustochemistry). Of specific note is the fact that DRM unravel all the features of tumor growth and meta-static processes, adaptation mechanisms to different types of stress and medical treat-ment for biological systems, etc. Second important finding based on literature data shows the same DRM nature of the effects of ultralow doses (ULD) of physical and chemical impacts (chemical agents, the irradiation of particles, light and electromagnetic fields, etc.) on solids, liquids and biological tissues [1]. These effects are due to mecha-nical hardening and softening on the scales of observation from the atomic (molecular) to microscopic cell structures, macroscopic organisms and populations. It is worth stre-ssing that the dependences of hardening-softening on pulse amplitude and duration are the same for micro- and macrodeformation of all the materials. The stress rate and the dwell time between the pulses (frequency), temperature, impurity concentration, irradi-ation dose of particles, electromagnetic fields, currents, etc. dependences of softening have the same V-shaped form for single and nanocrystals, liquids and biological tissues and organisms [1] (various types of adaptation to stress [2], apoptosis and proliferation of cells [3], aging, etc.).

1. Kisel, V.P. In: Untraditional natural resources, innovation technologies and products. Collected scientific works. Issue 10. RANS ed., Moscow, 2003, pp 183-196 (in Russian)
2. Garkavi, L.Kh., Kvakina, E.B., Kuz'menko, T.S. Antistress reactions and activation therapy. Moscow, RANS, IMEDIS, 1998, 617 p. (in Russian).
3. 3.Piruzian, L.A., Malenkov, A.G., Radkevich, L.A. Dokl. Akad. Nauk, 2004, vol 395, No 2, pp. 261-265.