

These HS effects are the parts of well-known time-spatial components of their physical/chemical developments in the body of the material (BT) volume. So, fine grinding of nuclei during the preparation of ULD (periodic milling-shaking in homeopathy, interrupted irradiations-deformations by the ULD of particles, currents, electromagnetic fields, drugs, etc.) changes the hardening/softening of IPT, matrix and foreign phases thus strengthening/weakening the effect of various doses and ULD on the matrix (BT, tumors, solids, liquids, polymers, etc.).

The common non-monotonous concentration dependencies of the size distributions of foreign nuclei and the other effects also explain the same non-monotonous concentration effect of low doses and ULD on physical, chemical, physiological and biochemical reactions in solids, liquids, polymers, solutions, BT, etc.

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 treatment for biological systems, etc.

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## **DEFORMATION OF MOLECULAR AND CELL STRUCTURES IS A GENERAL MECHANISM OF STRESS, ADAPTATION, CANCER GROWTH, AGING AND EVOLUTION IN THE SPECIES**

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Recent investigations irrefutably showed that real so-called solid solutions of crystals, glasses, melts, liquids, gases, plasma always contain nuclei and nanoclusters of various phases. So, the interfacial stresses due to structural and mechanical mismatch between phases, the universal mechanisms of plastic deformation and relaxation (PDR) on all scale lengths play the decisive role in the origin and development of phase transitions in solid, liquid, gaseous, plasma and biological forms of matter including chemical reactions, chronic endogenous diseases (cancer, aging, etc.), adaptation, origin of species, social behavior and even history [1]. This is confirmed by the correlation of transition parameters for various materials: shear moduli, viscosity, surface 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 them to grow at the expense of the others up to chemical compounds forming (homeopathy, mechanical alloying, sonochemistry, etc.). Of specific note is the fact that PDR unravel all the features of tumor growth and metastatic processes, adaptation mechanisms to different types of stress and medical treatment for biological systems, etc. Second important finding based on literature data shows the same PDR nature of the effects of ultralow doses (ULD) of physical (temperature drops, the

irradiation of particles, light and electromagnetic fields, etc.) and chemical impacts on solids, liquids, plasma, gases and biological tissues [1]. These effects are due to mechanical hardening and softening on the scales of observation from the atomic (molecular) to microscopic cell structures, macroscopic organisms and megascale populations.

It is worth stressing 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, irradiation 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.).

The new basic mechanism of phase transitions allows us to explain formerly unaccountable numerous experimental results on kinetics of endogenous diseases, aging and growth of robust and cancerous cells, development and differentiations in the growth of cells, organs and organisms, species and civilizations, to understand better the pathophysiology and morphology of cells and to provide a practical guide to consolidate and handle the giant information on these subjects and to develop new therapeutic strategies such as activation therapy and normobaric interval hypoxic training for the prevention and treatment of aging, cancer and chronic diseases, to increase social relations. It will be shown that a lot of puzzling features of the origin, development and various types of medical treatment of aging, cardio-vascular, cancerous and other endogenous diseases, and even history, civilization and natural events are well explained by the new mechanisms which are general for all types of phase transitions on nuclear-to-cosmic scale lengths. This work summarizes the data of our previous investigations with the new experimental results and a lot of conclusive-based literature data.

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## PHYSICAL BASIS OF ACTIVATION THERAPY. THE ORIGIN, EVOLUTION AND MEDICAL TREATMENT OF ENDOGENIC DISEASES AND AGING

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**Abstract.** This work confirms that it is the mechanisms and the periodical S-form stages of plastic deformation of biological tissues (BT) on different scales from molecular structures up to the fracture (apoptosis if cells and the death of all the living things) are the physical basis of the same periodical five sequential stages in the standard antistress nonspecific adaptational body reactions – all known archetypes of BT functional states: nonreactivity, training,