

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,

quiet activation, advanced activation and stress are responses of VT physiological parameters to the appropriate amplitudes, rates of growth and reduction and the frequency dependences of irritation stimuli. These stages of plasticity are common for all known states of matter: solid, liquid, gaseous, plasma and for ferroelectrics, magnetic substance, flux line lattices in the second type of superconductors and the so-called quantum crystals and liquids ( $\text{He}^3$  and  $\text{He}^4$ ), etc.

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## ИССЛЕДОВАНИЕ ПРОЧНОСТИ КОМПОЗИТОВ НА ОСНОВЕ АЛМАЗОВ, СПЕЧЕННЫХ ПРИ ВЫСОКИХ ДАВЛЕНИЯХ И ТЕМПЕРАТУРАХ

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В работе представлены результаты измерений теплопроводности и прочности на разрушение при одноосном сжатии образцов, полученных спеканием натуральных микрокристаллических (10–14 мкм) алмазов при давлении ~6 ГПа и различных температурах спекания от 1200 до 1900 °С.

Спекание проводилось в камере высокого давления типа тороид в 500 т.с. прессе ДЮ137. Прочность измерялась при одноосном статическом нагружении образцов. Теплопроводность измерялась в режиме постоянного теплового потока при постоянной температуре менее 200 °С в вакууме.

Лучшие образцы имеют теплопроводность до 500 Вт/(м\*К) и нормальную составляющую напряжения, при котором происходило разрушение ~3 ГПа.

Обнаружено, что по мере увеличения температуры спекания при постоянном давлении, происходит одновременное увеличение теплопроводности и прочности образцов. При дальнейшем повышении температуры спекания, происходит переход алмаза в графит, уменьшается плотность образцов, а прочность и теплопроводность падают. Увеличение прочности и теплопроводности композитов из алмаза связано с поверхностной графитизацией алмазных кристаллитов, составляющих образец.

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