

## TRANSPORT PROCESSES IN BIOMOLECULES AND QUANTUM INFORMATION

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The processes of energy and charge transfer in biomolecules play an important role in the vital activity of living organisms. For example, it is believed that protein molecules are the mediators of transfer of energy generated in the hydrolysis of triphosphate (ATP) for diverse biological processes such as photochemical reactions, cross-membrane ion transfer and muscle contraction. In its turn, charge migration in the DNA molecule resulting from, e.g., the action of ionizing radiation is directly related to the damage of DNA, which, as is known, can reduce the fidelity in the replication of the DNA molecule and, consequently, it can be the source of genomic mutations. Moreover, the description of transport processes in highly molecular structures at the quantum mechanical level makes it possible to consider also the question of quantum correlations arising in such systems. It is currently believed that quantum correlations and entanglement between the electronic states of nucleic acids in DNA are responsible, in particular, for the processes of its repair and replication. At the same time, it is important to realize that the transfer of energy and charge strongly depends on the molecular environment, which makes it extremely necessary to take the environment into account when describing such processes. Therefore, by studying the response in the dynamics of transport processes to changes in the environment, one can approach the analysis of the problems of adaptation and evolution.

In the proposed polaron approach to the description of transport processes in biomolecules, the possibility of energy and charge transfer in the form of states of a stable polaron (soliton) formed due to interaction with phonons is demonstrated. The nature of the polaron dynamics and the emerging quantum correlations between the structural elements of the macromolecular chain is analyzed taking into account the influence of temperature and the basic system parameters of the chain.

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