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Quantum dynamics of a hole migration through DNA.

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A model predicting the behavior of a hole acting on the DNA strand was investigated. The hole-DNA interaction on the basis of a quantum-classical, non-linear DNA single strand model was described. The fact that a DNA molecule is formed by a furanose ring as its sugar, phosphate group and bases was taken into consideration. Based on the model, results were obtained for the probability of a hole location on the DNA base sequences as well as on the sugar-phosphate groups mated with them.

The above considered model results in the following conclusions: the hole migration is a quantum phenomenon. The tunnel effect, owing to which the hole migrates through the chain bypassing the bases with a high ionization potential, influences the process of its migration considerably. The period of the hole migration lies in the range of time scales on which various processes in biomolecules and their solutions occur; the sugar-phosphate backbone possesses conducting properties affecting the hole migration process through the DNA strand considerably.

Short biography note

Sergey Shirmovsky, Mathematics and Physics Doctor (Ph.D.-nuclear physics). Higher / university-level education, Far Eastern State University, Vladivostok, Russia, 1986. 1987-1989: Research Officer, Laboratory of Theoretical Physics, Joint Institute for Nuclear Research, Dubna, Moscow Region, Russia. 1989-1993: Senior Researcher Physics Cathedra, Far Eastern State University. 1994: Laboratory of Theoretical Physics, Joint Institute for Nuclear Research, Dubna, Moscow Region, Russia, Ph.D. in Nuclear Physics. 1994-2004: Associate Professor, Physics Cathedra, Far Eastern State University. 2004-2015: Associate Professor, Theoretical and Experimental Physics Cathedra, Far Eastern State (Federal) University. Now is Head of Theoretical and Nuclear Physics Cathedra, Far Eastern Federal University. Scientific interests: quantum mechanics, quantum field theory, kinetics theory, biophysics, quantum dynamics of biological systems (DNA, Microtubules).

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