Nanochemistry and biotechnology

The use of wavelet analysis and a system of differential equations for a detailed study of the kinetics of electron phototransport in bacterial reaction centers.

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The paper presents the results of experimental studies of the cyclic electron transfer in the reaction centers (RC) *Rhodobacter spharoides* and the related effects of its kinetics structural self-regulation as a result of photoinduced structural changes. The analysis of two stages of RC photostimulation, the stage of donor oxidation under illuminated RC and the stage of RC relaxation (restoration of donor) after the light is switched off was held. The primary analysis consists in approximating each stage of photostimulation by sum of exponential functions, the number and parameters of which is determined programmatically [1]. Exponential components of photostimulation processes do not have substantial features, therefore their physical interpretation is difficult. Later, using the data of the primary analysis, wavelet analysis and differential equations system were applied to reveal the features of electron transfer kinetics for their comparison and identification. The results of these methods application showed that the revealed features of electron transfer kinetics were interrelated in all RC exposure modes (1÷600s) and intensity (0.5÷3.5mW/cm^2). The kinetics features obtained by wavelet analysis correspond either to the maximum of the RC substates occupancy, or to the initial zero points of substates occupancy in the RC relaxation phase, obtained by solving the differential equations system. The features has three types, which correspond to 3÷6, 30÷60, 100÷140 ms from the moment of switching on (off) the light and depend on the RC photoexcitation parameters. It is assumed that the maximum of occupancy levels both in the stages of RC illumination and RC relaxation is caused by the effects of reaction structural self-regulation.

1.Yu. M.Barabash, A.K.Lyamets, A Method for Decomposition of the Basic Reaction of Biological Macromolecules into Exponential Components, Nanoscale Research Letters (2016) 11:544 DOI 10.1186/s11671-016-1758-1