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DELAYED FLUORESCENCE OF EXOGENOUS PHOSPHORS IN TISSUES

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The results of studying the peculiarities of delayed fluorescence (DF) and phosphorescence (Ph) kinetics of exogenous phosphors (organic dyes molecules) in bio-tissues are presented. The applications of emitting relaxation of phosphor excitation as the measurable parameter for bio-tissue diagnostics are discussed.

The mammary tissues of both healthy and the BYRB line female mice with spontaneous tumors were studied. The tissue pieces cut in the process of the operation were put into the aqueous solution of a dye. The dyed tissues were put into the hermetic thermostatic chamber. The gas content of atmosphere over the dyed tissues surface was changed by gaseous nitrogen venting of the chamber. The kinetics of DF (λ_{max}=570 nm) and Ph (λ_{max}=680 nm) of dye molecules after pulse photo-excitation of bio-tissue were measured in the experiment.

The kinetics of DF luminescent is the result of three components superposition:

a) thermostimulated delayed fluorescence, *b)* luminescence due to singlet-triplet $T_1 + {}^1\Delta_g(O_2) \longrightarrow S_1 + {}^3\Sigma_g^-(O_2)$, *c)* triplet-triplet $T_1 + T_1 \longrightarrow S_1 + S_0$ annihilation.

It was found out that the luminescence kinetics are different for normal and pathogenic tissues. The contribution of singlet-triplet annihilation in the total DF signal in normal tissues is less than in tumourous ones thus making it evident that the effectiveness of dye molecules interaction with oxygen is less. As a rule, luminescence intensity in pathogenic tissues is higher than in normal ones, and DF duration is on average 15-20 % less.

The established differences in delay phosphor luminescence kinetics in tissues can be applied for tissues diagnostics. Diagnostics method based on measuring delay phosphor luminescence lifetime in comparison with measuring fluorescence intensity or light dispersion is more advantageous.