DELAYED LUMINESCENCE FROM BIOLOGICAL SYSTEMS WITHIN THE DAVYDOV SOLITON MODEL

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S u m m a r y

We report on the application of Davydov solitons to explain delayed luminescence (DL) arising from simple biological systems. The soliton model describes self-trapped localized electron or exeiton states in biological quasi-one-dimensional macromolecules and provides support for charge and energy transport for macroscopic distances. We have chosen alga *Acetabularia acetabulum* (A. a.) for the experimental and theoretical study as a model system due to the fact that this is a unicellular organism in which the cytoskeleton contains macromolecular structures (actin filaments, microtubules, etc.) of a lenght of several hundreds of angstroms and more. Namely in these structures, many-soliton coherent states can exist. We studied DL in the presence of an external source of light at a relatively high intensity of illumination. Kinetics and quantum yields of the DL from the system after its exposition for a finite time to a light source were calculated. It was found that the total number of photons emitted, is a non-linear function of the irradiation intensity, time of exposition, and dose of illumination. The quantum yield of DL first increases with the dose and then reaches saturation. The analytical results provide good fit of the experimental data obtained for A. a. in a large range of incident dose, up to saturation. We retain that further investigations, taking into acoount inhibition of the photosystem at a very high intensity or a dose of illumination, are necessary.