

Photochemical effects of white light on the Briggs-Rauscher self-oscillatory reaction

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Abstract

For the Briggs-Rauscher reaction, the synchronization effect for concentration self-oscillations of the system components under exposure to external periodic white light was investigated. The high sensitivity of the self-oscillatory mode of the reaction to periodic exposure to the light is demonstrated. The sync band dependence on the light power has been revealed. The power limits of external light exposure for which self-oscillations are not going on, have been established. The maximal oscillation synchronization range under external light exposure (from 0.04 up to 0.10 Hz) has been determined. “Frequency pulling” effect was observed for exposure to light with frequencies from 0.029 up to 0.039 Hz and from 0.10 up to 0.14 Hz. Under the influence of light from a lamp with a power of more than 500 W, the reaction was “turned off”, which is probably due to an increase in the rate of formation of intermediate components of the system and an increase in their concentrations at which it exited from a state of self-oscillation to a stationary state. In addition, the periodic exposure to white light led to “adaptation” of concentration oscillations of the BR reaction to the external action into the phase that is characterized by the blue color of the solution (the formation of clathrate “iodine-starch”), which can be explained by a sharp decrease in the concentration of hydrogen peroxide in the system and, consequently, oxygen. The sensitivity of the Briggs-Rauscher reaction to the spectral composition of the initial source indicates the expediency of its further studies.

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