Reaction-diffusion processes in the "adsorbate-substrate" system

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We obtain a chain of quantum kinetic reaction-diffusion-type equations for the light particles coupled to the surface. The particles are allowed to perform the underbarrier hopping to the nearest neighbouring sites, to oscillate between the ground and the 1-st excited states within a well, to interact with phonon subsystem and to take part in bimolecular chemical reactions. We study the temperature dependence of the kinetic kernels that define the activation behaviour of the diffusion coefficients and the reaction rates. It is shown that changing the "adsorbate-substrate" coupling one can alter the temperature dependence of the reaction rates. It is also indicated that mean field terms contribute to the activation energies of the reaction rates while they have a vanishing contribution to the activation energies of the diffusion coefficients. A possibility of transition from the quantum kinetic equations to the description on the chemical kinetics level is discussed.