

Oscillatory phenomena of the type of dissipative structures in model enzyme systems

Włodzimierz Klonowski

Chemical reactions proceeding in open systems can have a spatial and temporal organization as it is spectacularly demonstrated by the Byelousov-Zhabotinski reaction. Enzymatic reactions can also show periodicity which may play an important role in living organisms, conditioning the action of "biological clocks". Oscillatory processes may arise even in an open system containing only one multi-site enzyme. In particular, in such a system oscillation period can be controlled by inhibitors. Analysis of temporal changes of biological systems can be performed employing a set of differential equations reduced further to several equations describing key reactions. Analysis of stability of solutions of such an equation set accomplished using the phase method points to different unstable solutions of oscillatory type. Nonlinear thermodynamics predicts a possibility of formation of dissipative structures in open systems far from thermodynamic equilibrium, with defined boundary conditions.