Collective effects in active colloidal systems of complex composition under the action of laser radiation

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A special form of soft matter is widespread in nature—active colloidal systems, which are a dispersed medium (plasma, gas or liquid) containing tiny dispersed active particles or droplets. These systems are able to convert an external energy into their own directed motion [1]. One of such systems is emulsions. Active emulsions are stabilized structures of surface-charged droplets stable to coalescence. The mechanisms of activity and self-organization of artificial microobjects collectives are similar to activity mechanisms in natural systems [2]. Experimentally studied the motion and the structural characteristics in colloidal systems, which are quasi-two-dimensional structures of monodispersed droplets of emulsion of different composition, under the laser radiation. It was found that the action of laser radiation broke the order in the structures and colloidal systems was broken up. Diffusion coefficients, the balance of kinetic energy and energy of motion of droplets were analyzed. Conclusions about the efficiency of the mechanism of activity and energy dissipation in emulsion droplets of different compositions are obtained. The dependences of fractal dimensionality and mean localization area on the kinetic energy of motion in the structure of active emulsion droplets were analyzed.

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[2] Humphries N, Queiroz N and Dyer J 2010 *Nature* 1066–1069