VORTEX MOTION IN A MIXTURE OF ACTIVE AND PASSIVE BROWNIAN PARTICLES

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Active colloidal systems consist of absorbing microparticles distributed in a dispersive medium (plasma, gas or liquid). A specific aspect of such systems is the ability to convert external energy into directional motion [1]. Systems with solid-phase particles (such as dusty plasma and active suspensions) are characterized by the existence of charge distributed at the surface of active particles and influencing their kinetic properties. Active suspensions are able to form a stable dimensional structures, changing according to the external influence [2]. The mechanisms of activity and self-organization of collectives of artificial microobjects are similar to the mechanisms of activity in natural systems [3].

Experimentally studied the dynamic properties of the system of a mixture of active Brownian particles of melamine-formaldehyde with partial copper coating and passive uncoated particles in a viscous liquid medium (mineral oil) under the laser radiation exposure. Laser radiation of fixed power was driving the coated particles. Initially, the particles formed a one-directional closed flow of spherical shape. The active particles were carried away the passive particles. The particles obtained different velocities: the highest for active particles absorbing laser radiation and the lowest for passive particles. During the long exposure in the laser beam, the homogeneous flow was divided into two differently directed vortices, also occurred the separation of particles - slow passive particles moved out to the periphery.

Trajectories of motion of characteristic particles in time were reconstructed, velocities of motion were determined, curves of their mean-square displacement were obtained. Diffusion coefficients, kinetic energy of particles were analyzed.

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