Study of the nature of the effect of laser radiation power on Brownian motion in colloidal systems

Svetlov A S[1,2,@], Kononov E A[1,2], Petrov O F[1,2] and Vasiliev M M[1,2]

[1] Joint Institute for High Temperatures of the Russian Academy of Sciences, Izhorskaya 13 Bldg 2, Moscow 125412, Russia
[2] Moscow Institute of Physics and Technology, Institutskiy Pereulok 9, Dolgoprudny, Moscow Region 141701, Russia

[@] svetlov.anton.s@gmail.com

The results of an experimental study of the nature of the motion of a polydisperse emulsion system under the action of laser radiation of various powers are presented. The emulsion droplets were in an aqueous solution of the stabilizer and contained submicron carbon particles.

To study the nature of movement in the obtained emulsion systems, the droplets were exposed to laser radiation of various powers, their movement was observed using a stereomicroscope and recorded by a video camera.

As a result of processing the experimental video data for emulsion droplets, coordinates and velocities were obtained for each moment of time, kinetic energies were determined at various values of the laser radiation power, and graphs of the root-mean-square displacement versus time were plotted.

The movement of polydisperse drops of emulsions containing carbon particles was observed experimentally. Carbon particles can effectively absorb laser radiation, as a result of which the resulting thermophoretic force can set these particles in motion within the emulsion system, which in turn leads to the movement of the emulsion droplets themselves.

As a result of the analysis of the graphs of the root-mean-square displacement of the emulsion droplets and the dependence of the kinetic energy on the power density of the laser radiation, it was concluded that a change in the power of the acting laser beam leads to a change in the nature of the movement of the emulsion system.