Evolution of active Brownian motors in plasma, viscous fluid and superfluid helium

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In plasma, or viscous fluid, or superfluid helium, complex motion of micron-sized Brownian particles can be observed when the particles absorb the energy of laser radiation and convert it into motion energy. Such particles can be considered as active Brownian motors whose motion is controlled by radiation, and the mechanism of active Brownian motion itself is associated with photo- or thermophoresis (in plasma and liquid), or with the appearance of quantum turbulence (in superfluid helium). Active Brownian motors are able to obtain energy from external sources, store it and spend it on their own motion in the medium, which can lead to their self-organization and evolution.

The active Brownian motion of light-absorbing and strongly interacting particles far from equilibrium suspended in a gas discharge under laser irradiation has been studied, where the nature and intensity of the active motion depend on the radiation exposure. Emulsions of complex composition were experimentally obtained and their dynamics initiated by laser irradiation was investigated. Active Brownian motion and the evolution of structures due to quantum effects were experimentally observed for the first time for micron-sized particles levitating in superfluid helium.