Driven mixture of active/passive colloids in a constricted geometry

M.E. Foulaadvand[1]*, B. Aghaei[1], A. Saeidi[1], G. Volpe[2]

[1]Department of Physics, University of Zanjan, Zanjan, Iran
[2]Department of Physics, University of Gutenberg, Gutenberg, Sweden
*foolad@znu.ac.ir

Characteristics of a driven binary colloidal mixture are explored. The mixture is confined to a two dimensional narrow channel and consists of both active (self-propelled) and passive particles. The channel walls are hard and periodic boundary condition is applied along the channel. Colloidal particles perform Brownian motion in a solvent having a fixed temperature and interact with each other via a Debye-Huckel Coulombic interaction (Yukawa potential). A constant external force drives one of the species along the channel. Hydrodynamic interactions are neglected and the dynamics is assumed to be over-damped. The flow increases nonlinearly with the external force but does not exhibit a notable dependence on channel width. Above a critical driving force the system undergoes a homogeneous to laning transition. It is shown that the mean lane width as well as the laning order parameter increases with the channel width. We investigate the dependence of laning parameter on various quantities namely the number ratio of active to passive colloids, the magnitude of the externally driving force etc.

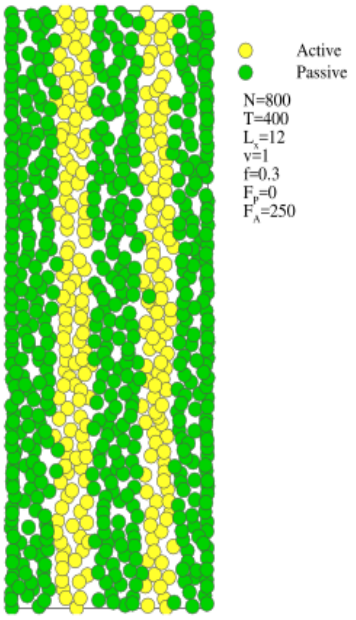

Figure 18:lane formation.

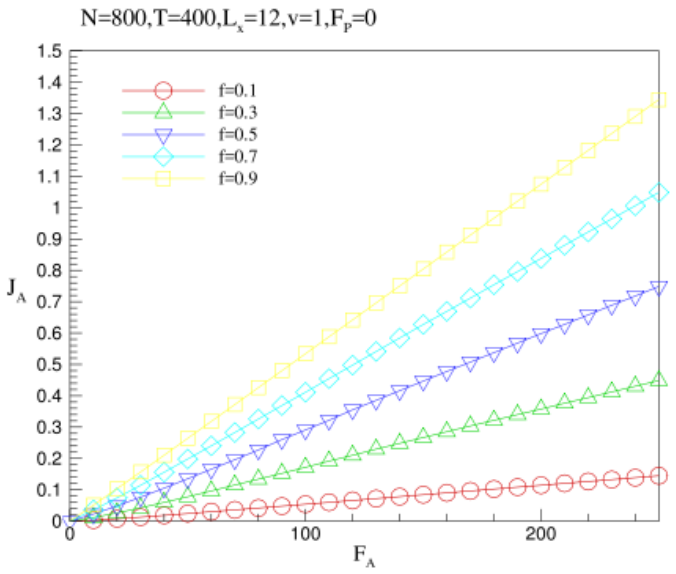

Figure 2: Flow of active particles versus external driving force

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References

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