



Contribution ID: 51

Type: **Contributed talk (20 min)**

Phase separation of passive particles in active liquids

The transport properties of colloidal particles in active liquids have been studied extensively. It has led to a deeper understanding of the interactions between passive and active particles. However, the phase behavior of colloidal particles in active media has received little attention. We have studied passive colloids dispersed in suspensions of active particles in experiments and simulations. Our study reveals dynamic clustering of colloids in active media due to an interplay of active noise and an attractive effective potential between the colloids. The size-ratio of colloidal particles to the bacteria sets the strength of the interaction. As the relative size of the colloids increases, the effective potential becomes stronger and the average size of the clusters grows. The simulations reveal a macroscopic phase separation of passive colloids at sufficiently large size-ratios. We will also present some recent results on the coarsening of passive particles.

References

[1] P. Kushwaha, V. Semwal, S. Maity, S. Mishra, and V. Chikkadi, Phase separation of passive colloids in active liquids, Phys. Rev. E, 2023 (accepted).

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