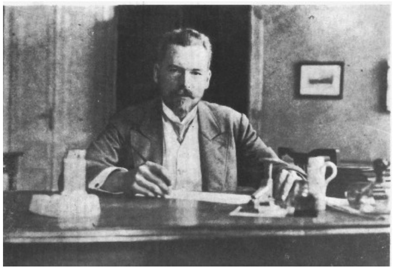

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Molecular arrest in binary mixtures induced by spatially correlated stochastic dynamics

Binary mixtures, i.e. the systems composed of two different species of particles, exhibit a huge variety of dynamical modes and phase transitions. This includes demixing effects and several combinations of mobility and arrest, e.g. the collective critical slow-down of the bigger particles mediated by the presence of the smaller molecules. It was recently realized that the interactions in such system could be effectively mapped on the Spatially Correlated Noise (SCN), i.e. the thermal noise that affects neighboring particles in a similar manner[1,2]. Following this idea, the over-damped SCN-driven Langevin dynamics was investigated as an effective, one-component model of dynamics in a dense binary mixture. It was found that the thermodynamically consistent Fluctuation-Dissipation Relation for such system provides a novel insight into the arrest effects [3]. I will show that the mechanism of singular dissipation is embedded in the dissipation matrix, accompanying SCN. The characteristic length of collective dissipation, which diverges at the critical packing is also identified. This is a new quantity, which conveniently grasps the difference between the ergodic and non-ergodic dynamics and is a measure of cooperativity in the system. The model is fully analytically solvable, one-dimensional and admits arbitrary interactions between particles. The transition is controlled by the interplay between the packing fraction and the noise correlation length, representing the packing fraction of smaller particles. As a practical example, both the hard spheres and the system of ultra-soft particles were studied. The framework of this model makes it is possible to discuss e.g. the re-entrant arrest.

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Summary

Primary author: Dr MAJKA, Maciej (Jagiellonian University)

Presenter: Dr MAJKA, Maciej (Jagiellonian University)

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