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# Reversible-irreversible transitions of particle trajectories in oscillatory sheared systems near the jamming transition

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## 概　要

A reversible-irreversible (RI) transition of particle trajectories was first investigated in a low density periodically driven colloidal system and it was found to be a continuous absorbing state transition [1,2]. It has been also discussed that the transition might belong to the directed percolation universality class [2].In the higher density systems, on the other hand, a RI transition is observed but the nature of the transition has not been clarified yet.

In this seminar, we present our recent studies on the RI transitions for various densities especially near the jamming transition by using oscillatory sheared molecular dynamics simulations. Here it is revealed that the transition behaviors are dramatically changed at the jamming transition density. In particular, above the transition density, we observe only the discontinuous RI transition and find that it is clearly correlated with the yielding transition [3]. On the other hand, below the jamming transition density, we find that there exist several distinct transitions depending on the density and strain amplitude, i.e., (i) continuous, (ii) reentrant, and (iii) weakly discontinuous RI transitions. We show that these transition behaviors are strongly correlated to the number of the contacts among the particles. This implies that these distinct transitions are explained in the context of the contact percolation and mechanical stability [4].

Refs:
[1] D. J. Pine, J. P. Gollub, J. F. Brady, and A. M. Leshansky, Nature **438**, 997 (2005).
[2] L. Corté, P. M. Chaikin, J. P. Gollub, and D. J. Pine, Nature Phys. **4**, 420 (2008).
[3] T. Kawasaki and L. Berthier, Phys. Rev. E **94**, 022615 (2016).
[4] K. Nagasawa, K. Miyazaki, and T. Kawasaki (in preparation).

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