

## **Local media structure and tracer shape determine how the translation-rotation decoupling occurs in two dimensional colloids**

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Translation-rotation decoupling is one of hallmarks of glassy dynamics; translation is often faster than expected from the viscosity of liquids unlike rotation. The decoupling relates closely to spatially heterogeneous dynamics where dynamically correlated regions emerge about molecular dimensions [1]. The translation-rotation decoupling and the dynamic heterogeneity are topics of significance when we aim to understand the nature of phenomena for various disordered solids.

In this poster, we present the dependence of the decoupling on tracer shape in two dimensional (2D) colloids using three representative tracer shapes (diamond, distorted diamond and square). We figure out that near the liquid-hexatic phase transition, the translation-rotation decoupling occurs for all tracers regardless of shapes, but trends are different for different shape. This dependence on tracer shape originates from commensurateness between tracer shape and local media structure. In other words, the diamond (square) tracer is commensurate (incommensurate) to the hexagonal bond orientational order, which determines a local media structure in the 2D hexatic phase [2]. Moreover, to our surprise, the shape dependent decoupling trend relates closely to the rotational diffusion of the tracers. The square tracer disturbs the hexagonal ordering of 2D colloids, thus resulting in faster rotation of square tracers, which is not observed for diamond shape tracers. Based on our simulation results in 2D colloids, we will investigate the connection between dynamic heterogeneity and its structural motif such as locally favorable structures in general glass-formers.

[1] J. Kim, C. Kim, and B. J. Sung, *Phys. Rev. Lett.* 110, 047801 (2013)

[2] J. Kim and B. J. Sung, *J. Chem. Phys.* 141, 014502 (2014)