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A Simulation Study on Translation-Rotation Decoupling and its Dependence on Tracer Shape in Two Dimensional Colloids JEONGMIN KIM, BONG JUNE SUNG, Department of Chemistry and Research Institute for Basic Science, Sogang University — Near the glass transition, translation is often faster than expected from the viscosity of liquids unlike rotation. It is the well-known translation-rotation decoupling phenomenon. 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 find that near the freezing (liquid-hexatic) transition, the translation-rotation decoupling occurs for all tracers regardless of shapes, but trends are different for different shape. In 2D, there exists an orientationally ordered liquid phase called a hexatic phase between isotropic liquid and solid phases. Entering the hexatic phase, 2D colloids exhibit the heterogeneous dynamics with several dynamic regions of different mobility like glass-forming liquids [1]. We find that the observed decoupling of tracer diffusion is attributed to the dynamic heterogeneity of 2D colloids. To our surprise, the shape-dependence of decoupling trend relate closely to the rotational diffusion of tracers. Square shape tracer disturbs the hexagonal ordering of 2D colloids, thus resulting in faster rotation of square tracers, which is not observed for diamond shape tracers.

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

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