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Inertial Particle Focusing Regimes in Suspension Flows through Square Dusts[1] HIROSHI YAMASHITA, Graduate School of Kansai University, TOMOAKI ITANO, MASAKO SUGIHARA-SEKI, Kansai University — Particles suspended in laminar flows through rectangular ducts are known to cross streamlines towards a discrete set of equilibrium positions in the duct cross section, due to the lateral force exerted on the particles arising from the inertial effect. For square duct flows, in particular, suspended particles were observed to be focused on four points at the center of channel faces at low Reynolds numbers. In the case of larger particle-to-duct-size ratios (≥ 0.3), however, a numerical study predicted that this type of equilibrium positions becomes unstable at similar Reynolds numbers and another type of equilibrium positions located on the diagonal near the channel corners becomes stable. In addition to these two types of equilibrium positions, recent experimental and numerical studies showed the presence of a new type of equilibrium positions on the heteroclinic orbit joining the above two types of equilibrium positions for the size ratio ~ 0.1. In this study, we investigated experimentally and numerically the equilibrium positions of neutrally buoyant spherical particles in square duct flows and classified their focusing regimes according to their stability, for the size ratio between 0.1 and 0.3 in a wide range of Reynolds numbers.

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Hiroshi Yamashita
Graduate School of Kansai University

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