

TRANSPORT PHENOMENA & FLUID MECHANICS

二维环形Couette设备中剪切引起的二维圆形固粒迁移的动态数值模拟

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摘要 The shear-induced migration of neutrally-buoyant non-colloidal circular particles in a two

-dimensional circular Couette flow is investigated numerically with a distributed Lagrange multiplier based fictitious domain method. The effects of inertia and volume fraction on the particle migration are examined. The results indicate that inertia has a negative effect on the particle migration. In consistence with the experimental observations, the rapid migration of particles near the inner cylinder at the early stage is observed in the simulation, which is believed to be related to the chain-like clustering of particles. The migration of circular particles in a plane Poiseuille flow is also examined in order to further confirm the effect of such clustering on the particle migration at early stage. There is tendency for the particles in the vicinity of outer cylinder in the Couette device to pack into concentric rings at late stage in case of high particle concentration.

关键词 [shear-induced particle migration](#) [dynamic simulation](#) [circular Couette flow](#) [clustering](#)

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Dynamic simulation of shear-induced particle migration in a two-dimensional circular Couette device

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Abstract The shear-induced migration of neutrally-buoyant non-colloidal circular particles in a two-dimensional circular Couette flow is investigated numerically with a distributed Lagrange multiplier based fictitious domain method. The effects of inertia and volume fraction on the particle migration are examined. The results indicate that inertia has a negative effect on the particle migration. In consistence with the experimental observations, the rapid migration of particles near the inner cylinder at the early stage is observed in the simulation, which is believed to be related to the chain-like clustering of particles. The migration of circular particles in a plane Poiseuille flow is also examined in order to further confirm the effect of such clustering on the particle migration at early stage. There is tendency for the particles in the vicinity of outer cylinder in the Couette device to pack into concentric rings at late stage in case of high particle concentration.

Key words [shear-induced particle migration](#); [dynamic simulation](#); [circular Couette flow](#); [clustering](#)

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