Contribution ID: **873** Type: **Poster Presentation of 1h45m**

Direct simulation of interactive motion of magnetic particles in an oscillating magnetic field

Wednesday, 30 August 2017 13:15 (1h 45m)

Manipulation of magnetic particles with the aid of dynamic magnetic fields including rotating and oscillating fields has been recently increased in various applications, such as mixing, separation and steering. In these processes, the motion behavior of particles is mainly dominated by the competition between magnetic force and induced hydrodynamic drags, and therefore both the inter-particle interactions and the particle-fluid should be considered in the simulations. In the previous studies, magnetic dipole-dipole interaction models are usually adopted in which each magnetic particle is assumed as a point with dipole moment responding to the external magnetic field, which cannot precisely capture the real dynamics of closely spaced particles. The aim of this work is to develop a coupled fluid-structure model based on the direct numerical scheme to investigate the dynamical behavior of magnetic micro-chain under the influence of an oscillating magnetic field, taking into account magnetic and hydrodynamic interactions between particles in a fully coupled manner. In the simulations, the Arbitrary Lagrangian-Eulerian method is used for dealing with the movement of the particles, and forces acting on particles are calculated based on the Maxwell stress tensor and hydrodynamic stress tensor. The simulation results are compared with the existing experiment studies and show good qualitative agreements. These results could provide an efficient way to predict the motion behavior of magnetic particles under dynamic magnetic fields in various applications.

Submitters Country

China

Primary author: Dr CAO, Quanliang

Co-authors: Mr LI, Zhenhao; Mr HAN, Xiaotao; Dr WANG, Zhen; Prof. LI, Liang

Presenter: Dr CAO, Quanliang

Session Classification: Wed-Af-Po3.07

Track Classification: E4 - Levitation and Magnetic Bearings