



深圳北理莫斯科大学

УНИВЕРСИТЕТ МГУ-ППИ В ШЭНЬЧЖЭНЕ

SHENZHEN MSU-BIT UNIVERSITY

应用数学讲座

Научный Семинар по Прикладной Математике

Research Seminar on Applied Mathematics

应用数学报告（10）

报告人 / Докладчик / Speaker:

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题目 / Название / Title:

A diffuse interface model for two-phase magnetohydrodynamics (MHD) flows and its energy stable approximations

时间 / Время / Time: 12月9日 8:00-11:30 a.m.

地点 / Место / Venue: 数学中心会议室（主楼 336）

摘要 / Аннотация / Abstract:

The problem of two-phase magnetic fluid has an important application in the Blanket and its laying process in Fusion device, but the research on the two-phase MHD model and its numerical calculation is rare in the literature. To solve the problem of MHD flow with different viscosity and conductivity, a two-phase MHD model based on diffusion interface is proposed. The model consists of Navier-Stokes equations, Maxwell equations and Cahn-Hilliard equation which are coupled via a fluid induced transport term in the Cahn-Hilliard equation, the extra phase induced stress term and Lorentz force term in the Navier-Stokes equations, and Ohm's law in the Maxwell equations. This phase field model can effectively describe the geometric transformation of interface, such as the evolution of self intersecting, pinching, reconnecting and splitting interface, and can maintain the overall mass conservation. We design an efficient numerical method for the two-phase MHD model based on the diffusion interface. The space is discretized by the finite element method, and the time is discretized by the first-order semi implicit scheme combined with the convex splitting method. Numerical examples of two-phase Hartmann flow and threedimensional shear two-phase MHD are designed to verify the proposed model and the reliability of the numerical method.

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