Academy of Mathematics and Systems Science, CAS
Colloquia & Seminars

Speaker: Professor Xiaofeng Yang，Department of Mathematics, University of Southern Carolina, USA

Inviter: Associate Professor Chong Chen

Title: Efficient algorithms for the anisotropic dendritic crystal models

Language: Chinese

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Abstract:

We consider numerical approximations of the anisotropic phase-field dendritic crystal growth model. This is a highly complex coupled nonlinear system consisting of the anisotropic Allen-Cahn equation, the heat equation, and the Navier-Stokes equation. Through the combination of the novel EIEQ approach with the novel "zero-energy-contribution" method, we develop an efficient numerical scheme with linearity, fully-decoupled structure, unconditional energy stability, and second-order time accuracy. In the process of obtaining a full decoupling structure and maintaining energy stability, the introduction of auxiliary variables and the design of their auxiliary ODEs play a vital role. The unconditional energy stability of the scheme is achieved, and the detailed implementation process is given. Through several numerical simulations of 2D and 3D dendritic crystal growth examples, the effectiveness of the developed algorithm is also verified.

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