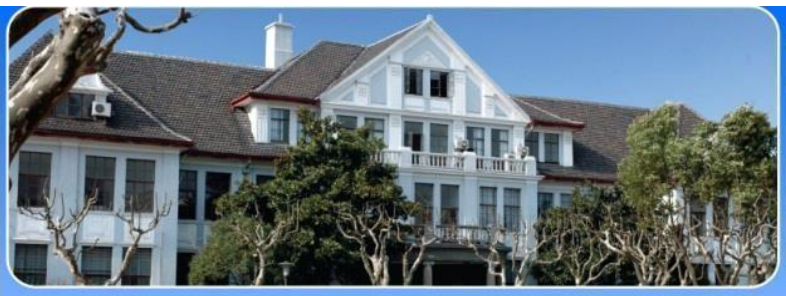


复旦大学数学科学学院
数学综合报告会

报告题目：A structure preserving, entropy stable numerical scheme for the variable-temperature phase field crystal equation

报告人：王成 教授 (University of Massachusetts, North Dartmouth)

时间：2022-11-23 星期三 10：00-11：00

地点：Zoom网址：https://umassd.zoom.us/j/6339263022，密码:123456

报告摘要：

A thermodynamically-consistent phase field crystal (PFC) model of solidification with heat flux, in which the non-constant feature of the temperature plays an important role, is considered. The resulting system consists of two equations, a heat-like equation for the temperature variable, combined with a gradient flow for the density variable, in which the Flory-Huggins potential is involved in the PFC-type free energy. Such a physical system describes how the atom density changes in time and space. In particular, a monotone functional of the temperature is included in the chemical potential, while the temporal variation of the density variable is included in the temporal evolutionary equation. These coupled terms lead to an entropy production law. A numerical scheme is proposed and analyzed. The unique solvability and positivity preserving property, for both the temperature and density variables, are theoretically justified for the proposed numerical scheme. In particular, the singular nature of the logarithmic energy potential and the monotone functional of the temperature prevent the numerical solution approach the limit value. In addition, an iteration construction technique is applied in the positivity-preserving and unique solvability analysis, motivated by the complicated form associated with the temperature functional. The entropy stability of the proposed numerical scheme could be derived by a careful estimate. A few numerical results are also presented.

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