

数学与系统科学研究院

计算数学所学术报告

报告人: **Dr. Zhiping Mao**

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报告题目:

**Fractional Phase Field Crystal  
Modelling: Analysis, Approximation  
and Pattern Formation**

邀请人: 于海军 副研究员

报告时间: 2020 年 11 月 19 日 (周四)

上午 10:00-11:00

报告地点: 科技综合楼

311 教室

## **Abstract:**

It is found that choosing the value of appropriately leads to fractional order Swift-Hohenberg equation (FSHE) giving a markedly superior fit to experimental measurements of the structure factor than obtained using the SHE () for a number of crystalline materials. The improved fit to the data provided by the fractional partial differential equation prompts our investigation of a Fractional Phase Field Crystal (FPFC) model based on the fractional free energy functional. It is shown that the FPFC is well-posed and exhibits the same type of pattern formation behaviour as the PFC, which is crucial for the success of the PFC model, independently of the fractional exponent . This means that the FPFC model inherits the early successes of the PFC model such as physically realistic predictions of the phase diagram etc. and, therefore, provides a viable alternative to the classical PFC model.

Whilst the salient features of PFC and FPFC are identical, we expect more subtle features to differ. The prediction of grain boundary energy arising from a mismatch in orientation across a material interface is another notable success of the PFC model. We compare the predictions obtained using the PFC and FPFC models with experimental observations of the grain boundary energy for several materials. It is observed that the FPFC model gives superior agreement with the experimental observation than those obtained using the classical PFC model, especially when the mismatch in orientation becomes larger.

## **报告人简介:**

毛志平博士 2015 年毕业于厦门大学计算数学专业, 2015 年 10 月至 2020 年 9 月在美国布朗大学应用数学系从事博士后研究, 其目前就职于厦门大学数学科学学院。毛志平博士目前在 JCP, SISC, SINUM 等国际高水平杂志上发表论文 20 余篇。

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