

情報科学研究科 重点プロジェクト

数学と諸分野の協働推進による
学際的・総合的な新領域研究の開拓

M A T H E M A T I C S × E X T E N S I V E S C I E N C E

第23回講演会 兼 第70回応用数学連携フォーラム

日時

2018年10月12日(金)16時00分～17時30分

会場

東北大学 情報科学研究科棟 中講義室

講演者

Pierre Antoine Geslin (Tohoku University)

タイトル

Phase-field modeling: application to liquid metal dealloying

概要

Phase-field modeling has emerged in the field of materials science as a tool of choice to investigate a variety of free boundary problems such as alloy solidification, grain growth, brittle fracture or dewetting. This approach consists in introducing a field that defines implicitly the interfaces between the different phases. Partial differential equations on this phase-field and on other relevant parameters are then chosen to incorporate the appropriate physics for the problem at hand. In the first part of my talk, I will present the general framework of phase-field modeling and discuss its capabilities to study various free boundary problems. In the second part of my talk, I will present its application to investigate the formation mechanism of microstructures obtained from liquid metal dealloying. This new processing technique enables to manufacture finely porous structures of various nature (non-noble metals, refractory metals or semi-conductors) presenting a high surface area, valuable in numerous applications (catalysis, battery materials, sensors,...). The development of a phase-field model allowed to clarify the details of the formation mechanism that can be seen as an interfacial spinodal decomposition. In addition, we show that the dealloying process is limited by diffusion of the dealloyed element in the liquid melt and we relate the size of the obtained microstructure to the dealloying rate.



<http://www.math.is.tohoku.ac.jp/~project/>