

[PO-F2]Poster Session 2

Symposium F

2018年10月31日(水) 17:45 ~ 20:00 Poster Hall

[P2-47]Multi-GPU large-scale phase-field lattice Boltzmann simulation of dendrite growth with thermal-solutal convection

○Shinji Sakane¹, Tomohiro Takaki¹, Munekazu Ohno², Yasushi Shibuta³, Takayuki Aoki⁴ (1.Kyoto Institute of Technology, Japan, 2.Hokkaido University, Japan, 3.The University of Tokyo, Japan, 4.Tokyo Institute of Technology, Japan)

Thermal-solutal convection, that inevitably occurs during terrestrial solidification of an alloy, drastically changes the dendrite morphology and microsegregation. Although phase-field method is the most powerful computational tool for predicting the dendrite morphology and microsegregation, we need many computational costs in the phase-field simulation taking the thermal-solutal convection into account. In this study, we enable a large-scale simulation for phase-field lattice Boltzmann model, which can express the dendrite growth with the transport of solute and heat and the fluid flow. Here, to reduce the computational cost, we employ a multi-level mesh and multi-level time step when solving phase-field equation, advection-diffusion equations for heat and solute, and lattice Boltzmann equation for computing the fluid flow. In addition, to accelerate the large-scale simulation, we implement the parallel computation using multiple graphics processing units (GPU). By employing the developed scheme, we perform the dendrite growth simulation during directional solidification of a binary alloy with thermal-solutal convection and investigate the effects of thermal-solutal convection on the dendrite morphology.