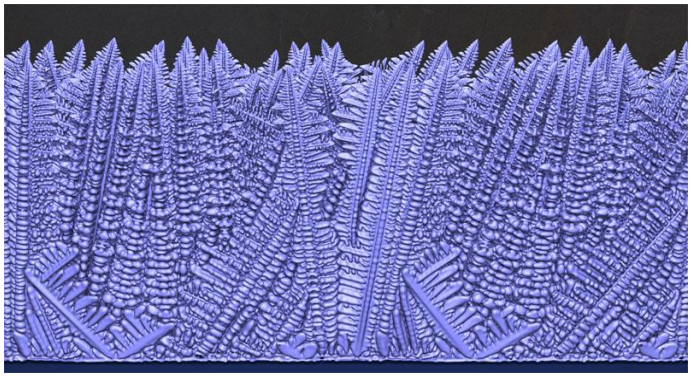
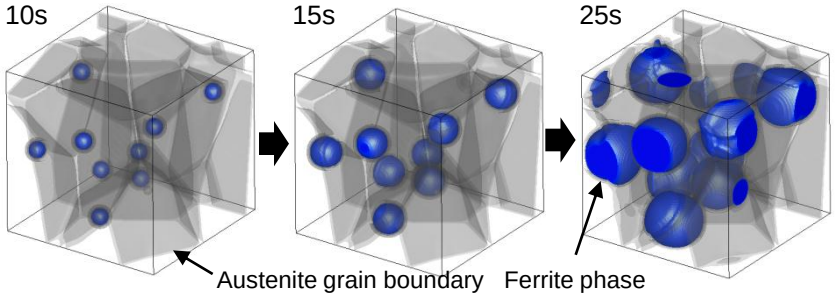
Development of Next Generation Material Design Method Based on Phase-Field Method

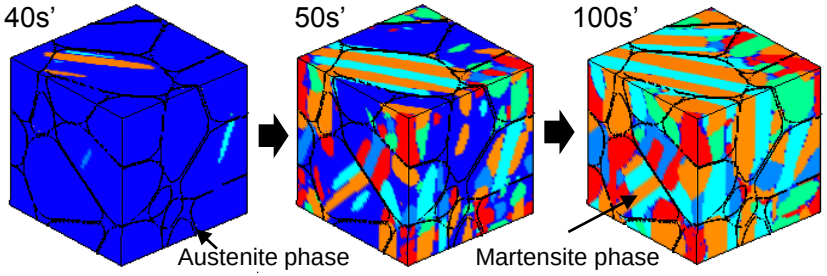
It is essential to produce high performance materials for developments of next generation automobiles and airplanes. In this study, we are constructing a new material design method based on the phase-field method, which can predict microstructural morphology and mechanical properties simultaneously. Furthermore, we also apply GPGPU computation to numerical simulation for realizing efficient material design. Though these multidisciplinary researches, we bring up superior human resources having a general engineering sense.



Extreme large scale phase-field simulation of solidification in Al-Si Alloy

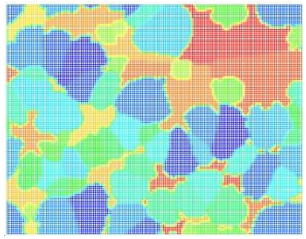


Multi-Phase-Field simulation of microstructure evolution in ferrite transformation during continuous cooling of a steel.



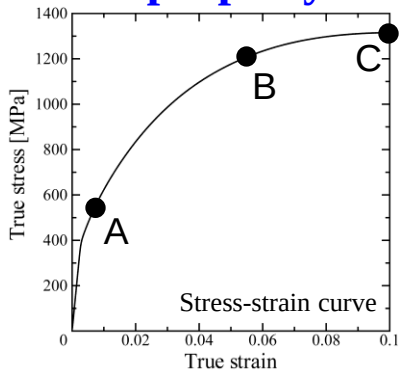
Multi-Phase-Field simulation in microstructure evolution in martensitic transformation during quenching of a steel.

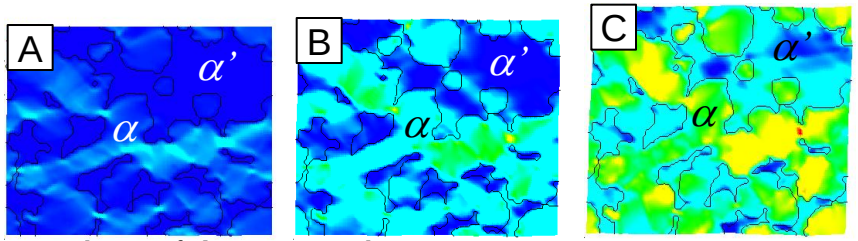
From prediction of microstructure to evaluation of mechanical property



Finite element mesh modeled from results of a phase-field simulation

Image-based finite element analysis





Distribution of plastic strain in the microstructure

Evaluation of mechanical property of steel based on the microstructural morphology obtained from the phase-field simulation.