Ferrite Transformation Behavior in Deformed Austenite During Continuous Cooling: Multi-Phase-Field Simulation and Experimental Study

*Shingo Ishida¹, Akinori Yamanaka², Yuichiro Koizumi³, and Yunping Li³

¹Department of Mechanical Systems Engineering, Graduate School of Engineering, Tokyo University of Agriculture and Technology, 2-24-16, Naka-cho, Koganei-shi, Tokyo 184-8588, Japan.
²Division of Advanced Mechanical Systems Engineering, Institute of Engineering, Tokyo University of Agriculture and Technology, 2-24-16, Naka-cho, Koganei-shi, Tokyo 184-8588, Japan.
³Institute for Materials Research, Tohoku University, 2-1-1, Katahira, Aoba-ku, Sendai-shi, Miyagi, 980-8577, Japan.

*Corresponding author: 50010255010@st.tuat.ac.jp

In order to predict mechanical properties of steel numerically, it is essential to simulate the formation of ferrite phase in steel-making process. In this study, microstructure evolution in austenite-to-ferrite transformation occurred in deformed austenite phase in hot working and continuous cooling process, is predicted by multi-phase-method. Furthermore, since experimental validation is important to estimate the ferrite nucleation behavior and identify unknown parameters, we conduct experiments of the hot working and subsequent continuous cooling process using a hot working simulator. By comparing experimental results with simulation outcome, the accuracy of the simulation model can be improved.

**Keywords:** Austenite-to-Ferrite Transformation, Hot Working, Continuous Cooling, Multi-Phase-Field Method