APCOM & ISCM
11-14th December, 2013, Singapore

Image-based Numerical Tensile Test of Dual-Phase Steel using Homogenized Crystal Plasticity Finite Element and Multi-Phase-Field Methods

***Keisuke Hashimoto[1], and Akinori Yamanaka[2]**

[1]Department 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.
[2]Division 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.

*Corresponding author: 50013643048@st.tuat.ac.jp

Mechanical properties of dual-phase (DP) steel, where is frequently used for automotive sheet steel, strongly depends on its underlying microstructural morphology of martensitic and ferrite phases. Therefore, in order to improve strength and elongation of DP steel, it is essential to clarify relationship between the morphology of microstructures and the mechanical properties of the steel. In this study, a framework of numerical material test using homogenized crystal plasticity finite element and multi-phase-field methods is developed. By means of this method, morphology of ferrite and martensite phases in DP steel is predicted by the multi-phase-field method. Furthermore, on the basis of the predicted microstructural image, image-based finite element analysis of uni-axial tensile deformation behavior of DP steel can be simulated.

Keywords: Dual-Phase Steel, Numerical Tensile Test, Crystal Plasticity Finite Element Method, Phase-Field Method