



アラカルト

講演大会学生ポスターセッションに参加して

第178回日本鉄鋼協会 秋季講演大会学生ポスター セッション最優秀賞を受賞して

Getting “The Best Poster Award of Poster Session for Students” in 178th ISIJ Meeting

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1. Introduction

It is my great honor to have this opportunity to show my research in the Student Poster Session of 178th ISIJ Autumn Meeting held at Okayama University and receive the best award with the title “Effect of Nb addition on ferrite transformation in low carbon steels”.

2. About My Research

Steels have so far become the most widely used metallic alloys all over the world. In aim to achieve property optimization, microstructural control is of great significance, which requires a deep understanding of solid state transformation in steelmaking process. In particular, the decomposition of fcc-austenite into bcc-ferrite attracts much attention owing to its essential basis for other related phase transformations occurring at lower temperatures such as bainite and martensite transformations. As one of the main issues on ferrite transformation, the alloying element (e.g. Mn, Si, Cr, Ni, Mo) interactions with migrating α/γ interfaces has been extensively studied in the past decades, which yields fruitful achievements on physical metallurgy and contributes much to industrial applications.

Nb is widely used micro-alloying element in steels to retard the ferrite transformation via the inhibition of both ferrite nucleation and growth. The origin of the latter has been recognized to be caused by solute drag effect (SDE) due to

Nb segregation at α/γ interface. Slow diffusion of Nb atoms across interface will reduce available driving force on interface motion thus causing energy dissipation. However, the amounts of Nb segregation and energy dissipation have not been quantified yet, and occurrence of interphase precipitation (IP) during ferrite growth leads to the issues even more complex.

Therefore, the objective of my research is to quantitatively clarify the effect of Nb segregation on interface migration during ferrite growth. Two alloys Fe-0.1C-(0.03, 0.06)Nb (mass%) are used to conduct interrupted isothermal experiments at 825°C. Three-dimensional atom probe reveals that Nb solutes segregate at migrating α/γ interface with non K-S orientation relationship, whose amount increases with transformation time. The energy dissipation estimated from interfacial C content quantified by field-emission electron probe microanalysis (FE-EPMA) technique is found to decrease with longer holding time while increases with more Nb addition. SDE model with optimized segregation parameters can reproduce the energy dissipation with measured amount of Nb segregation and interface velocity for 0.03Nb alloy in the case of little IP, while a significant underestimation is generated for 0.06Nb alloy, which is presumably attributed to the reduction of Nb in solution caused by the frequent formation of interphase-precipitated NbC.

3. Research Life

As a foreign student with poor Japanese, it is challenging to quickly adapt myself into Japanese environment, even though some kanji in documents similar to Chinese can be occasionally recognized. Fortunately, the members in our lab are very nice and give me enormous supports. My advisors, Prof. Tadashi Furuhashi, Associate Prof. Goro Miyamoto and Assistant Prof. Yongjie Zhang give lots of useful advices on my personal and academic matters. Their diligent work and rigorous attitude toward academy set a good model for me to carry out my research. One big difference from domestic research is that seminars and discussions are quite usual in the lab, during which the exchange of new ideas is promoted and the efficiency on problem solving is highly improved. In addition to research life, our lab will also organize many meaningful activities like fishing, picnic, sightseeing and excursions, which greatly enrich my daily life and help me learn more about Japanese cultures. I am really happy for being a part of this lab where the people make me feel at home.

4. Future Plan

Here, I have to appreciate the Joint Education Program between Tohoku University and Tsinghua University for providing me this valuable opportunity to study abroad. After finishing the Master Thesis, I will go back to Tsinghua University to continue my PhD research. I believe this award will inspire me to move forward on fundamental research and to make contributions for materials design.

5. Acknowledges

Lastly, I would like to express my sincere gratitude to all the lab members for their great guidance and selfless help. Special thanks should be given to my family for their deep love and continuous support. Without them I could not finish this work smoothly.



Lab members in 2019 ISIJ Autumn Meeting at Okayama University
(The author is at the third left of the first row)

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