Foreword

Atomistic Effects in Migrating Interphase Interfaces—Recent Progress and Future Study

Atomistic motion of migrating interfaces is one of the most fundamental issues for understanding mechanisms of phase transformations. In *Metallurgical and Materials Transactions A*, the structure and kinetics of migrating interphase interfaces have repeatedly been taken as a subject of special issues. Many of these symposia were held under the auspices of the TMS/ASMI Phase Transformation Committee. The readers could follow such history by tracking the following list of the related special issues.

- “Symposium on The Massive Transformation,” March 1984
- “International Conference on Bainite,” April and June, 1991
- “The Role of Ledges in Phase Transformations,” June, 1991
- “Pacific Rim Conference on The Roles of Shear and Diffusion in the Formation of Plate-Shaped Transformation Products,” September and December 1994
- “Symposium on Mechanisms of the Massive Transformation,” August 2002
- “The Effects of Alloying Elements on the Gamma to Alpha Transformation in Steels,” April 2004.
- “Hume-Rothery Symposium on Structure and Diffusional Growth Mechanisms of Irrational Interphase Boundaries,” March 2006
- “Hillert Symposium on Thermodynamics and Kinetics of Migrating Interfaces in Steels and Other Complex Alloys,” June 2006

After the above mentioned series, the Phase Transformations Committee paid special attention again to recent developments in the research area on migrating interphase interfaces and decided to organize another symposium on “Atomistic Effects in Migrating Interphase Interfaces: Recent Progress and Future Study” held as part of the TMS 2012 Annual Meeting, Orlando, FL in March, 2012. It was necessary because the recent progress in experimental and theoretical studies on the interfacial structure and chemistry, particularly with application of advanced analytic techniques and computational materials science, is significant.

In this symposium, we covered two major parts:

In the first part, the structure and mobility of interphase interfaces were focused. Specific attention was given to more recent development and understanding of models and theories on crystallographic features and the growth of plates-shaped products in diffusional and displacive phase transformations. Advances in the understanding of lattice correspondence and in the extension of phenomenological theory of martensite crystallography to diffusional phase transformations were also covered.

In the second part, alloying effects on migrating phase interfaces were discussed in the form of the 11th ALEMI workshop, which was initiated in conjunction with the 2000 TMS Fall Meeting and held every year in the last decade. Modeling and characterization of interface boundaries in phase transformations in structural metals and alloys have been central issues with the object of predicting the microstructural consequences of their processing. Specific discussion of the mechanisms of austenite decomposition in steels was made. A history of the workshop is summarized in the corresponding website (www.alemi.ca) and the following article:

“ALEMI: A Ten-Year History of Discussions of Alloying-Element Interactions with Migrating Interfaces”

Gary Purdy, John Ågren, Annika Borgenstam, Yves Bréchet, Masato Enomoto, Tadashi Furuhashi, Ernst Gamsjäger, Mohamed Gouné, Mats Hillert, Christopher Hutchinson, Matthias Militzer, Hatem Zurob
Metallurgical and Materials Transactions A, 2011, Vol. 42, Issue 12, pp. 3703–3718

In the three-day symposium held in TMS 2012, there were 19 invited and 22 contributed talks. Progress in theoretical treatments such as development of improved models and experimental study on kinetics, structure, and chemistry was introduced. It was also seen that application of various advanced characterization tools and computational modeling of migrating interfaces were made for an in-depth understanding of these aspects. This set of papers is taken from the symposium. We hope that the current and the new generations of researchers continue to explore in this challenging research field with an increased interest by following the above mentioned history with this special issue.

Finally, the organizers would like to express sincere thanks to all the symposium attendants; the TMS/ASMI Phase Transformations Committee under the chairmanship of Prof. Yunzhi Wang (Ohio State University) for the sponsorship of the symposium; and Prof. David E. Laughlin, Principal Editor, and Ms. Dora Moscatello, Production Editor, *Metallurgical and Materials Transactions* for supervising the review process for the papers of this symposium.

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