北海道大学　大学院工学研究院　材料科学部門主催

第93回マテリアルセミナー

下記の要領で第93回マテリアルセミナーを開催いたします。多数ご参加くださいますようご案内申し上げます。

記

日時：平成28年5月18日（水）14:00～15:00
場所：北海道大学工学部　材料化学棟５階　大会議室（MC526）
講師：Dr. Zhipeng Guo,
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題目：On the solidification kinetics of metal alloys: A study using 3-D phase field modeling and synchrotron X-ray image techniques

概要：To reveal the underlying physics during solidification of metal alloys requires development of powerful and effective methodology, including both experimental and modeling approaches. The advancement of the 3rd generation synchrotron X-ray image techniques enables us to observe phase transitions during solidification of metallic alloys in situ, which greatly alter our traditional viewpoint concerning the basic solidification behaviors including dendrite growth, crystal orientation selection, and coarsening. Besides, the state-of-art phase field model is becoming more popular nowadays to simulate such microstructure transition during solidification. Currently, a great deal of effort has been focused on further development of these two powerful tools and accordingly my research attention has been focused on:
(1) Development of a 3-D phase field model to simulate the microstructure transition during solidification of metal alloys. In particular, an algorithm, namely Para-AMR, comprising of adaptive mesh refinement (AMR) and parallel (Para-) computing capabilities was developed to solve the phase field equations. Numerical tests results revealed that this algorithm could improve the computational efficiency for about three orders of magnitude, greatly shortening the computation time for solving the phase field equations.
(2) In situ observing the microstructure transition in response to the external forces (electromagnetic fields, ultrasound and mechanical stirring) using synchrotron X-ray. Both radiography and tomography were applied to reveal the full physics of the solidification phenomena in real space and time scales, and to fully testify the validity of the phase field modeling results.
Accordingly, important solidification behaviors, including dendrite growth (for both aluminum alloy and magnesium alloy), fragmentation, and coarsening were studied, compared with either experiment results or existing theories, and new physics were revealed.

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