Multi-phase-field Modelling of Austenite-to-ferrite Transformation in Deformed Austenite Phase

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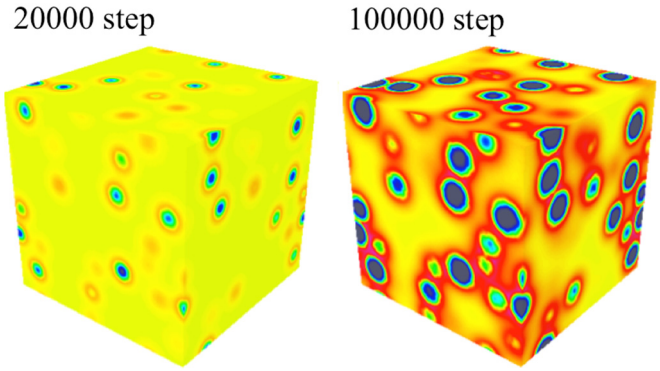
A computational model to simulate the austenite-to-ferrite transformation in a Fe-C alloy using the multi-phase-field (MPF) method and the crystal plasticity fast Fourier transformation (CPFFT) method was developed. Using the model, first, plastic deformation behavior of the austenite phase during plane strain compression was simulated by the CPFFT method. From the CPFFT simulation, we calculated the distributions of stored energy and misorientation in the deformed austenite phase and estimate nucleation rate and sites of the ferrite grains. Furthermore, according to the estimated nucleation condition, the ferrite grain growth and the carbon diffusion behavior during the austenite-to-ferrite transformation in the deformed austenite phase was simulated. The figures show the evolution of carbon concentration during the ferrite grain growth simulated by the MPF method [1].



1) A. Yamanaka, Proceedings of the International Conference on Solid-Solid Phase Transformations in Inorganic Materials 2015, Edited by Matthias Militzer, Gianluigi Botton, Long-Qing Chen, James Howe, Chadwik Sinclair, and Hatem Zurob, (2015), pp. 857-864.

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