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Phase-field Simulation for Analyzing Time Evolution of Grains of Precipitate in Phase Decomposition Processes of Magnetic Alloys YOSHIHARU KANEGAE, Mechanical Engineering Research Laboratory, Hitachi, Ltd. — The time evolution of the average grain size and the number of grains of precipitate in phase decomposition processes of magnetic alloys in two-dimensional systems was investigated using phase-field simulation. Specifically, the phase decomposition processes of Fe-Cu and Fe-Cr systems were studied. Chemical free energy from a thermodynamic database of phase diagrams was used and magnetic contribution was considered. In appropriate compositions, these systems show spinodal decomposition followed by Ostwald ripening. In the long-time region of these processes, the time evolution of the average grain size and the number of grains of precipitate was evaluated by the power of time. The exponent of the power of time of the average grain size α was $\alpha\sim1/3$, consistent with the Lifshitz-Slyozov-Wagner theory. On the other hand, that of the number of grains β was $\beta\sim$-2/3, inconsistent with the theory, which predicts $\beta\sim$-1. However, it was shown that in two-dimensional systems these results are reasonable.

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