Energy-dissipation in a coupled system of Allen–Cahn type equation and Kobayashi–Warren–Carter type model of grain boundary motion

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Abstract

In this paper, we consider a system of initial boundary value problems for parabolic equations, as a generalized version of the "φ-η-ϑ model'' of grain boundary motion, proposed by Kobayashi [16]. The system is a coupled system of: an Allen–Cahn type equation as in (1.1) with a given temperature source; and a phase-field model of grain boundary motion, known as "Kobayashi–Warren–Carter type model". The focus of the study is on a special kind of solution, called energy-dissipative solution, which is to reproduce the energy-dissipation of the governing energy in time. Under suitable assumptions, two Main Theorems, concerned with: the existence of energy-dissipative solution; and the large-time behavior; will be demonstrated as the results of this paper.

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