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Time relaxation of a phase-field model with entropy balance

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(Submitted on 18 Jul 2011)

We deal with a system of two coupled differential equations, describing the evolution of a first order phase transition. In particular, we have two non-linear parabolic equations: the first one is deduced from a balance law for entropy and it describes the evolution of the absolute temperature; the other one is an equilibrium equation for microforces and it regulates the behaviour of a scalar phase parameter. Moreover, the second equation shows a time-relaxation coefficient related to the time-derivative of the phase parameter. We prove well-posedness of solution to the given system, using a standard method of approximating problems; afterwards, we study the behaviour of the system as the time-relaxation coefficient tends to zero: as a result, we find out that the original problem converges to a new problem, with a stationary phase equation.

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