ATTRACTORS OF PHASE-FIELD SYSTEMS WITH MEMORY

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Abstract. We give a systematic presentation of a series of results about the longterm behavior of certain phase-field systems with memory effects. These systems rule the evolution of the temperature ϑ and the phase-field χ in a material subject to phase changes. We assume that the internal energy and the heat flux depend on the past history of ϑ. Therefore, the energy balance leads to an integro-partial differential equation for the evolution of ϑ, coupled with a partial differential equation for χ. The latter can be a reaction-diffusion type equation with a cubic nonlinearity or, for phase separation processes, a fourth-order equation of Cahn-Hilliard type. In both cases, by introducing the summed past history of ϑ as an additional variable, we reformulate the equations, endowed with proper boundary conditions, as dissipative dynamical systems in suitable phase-spaces which account for the past history. Then we state theorems about the existence of finite dimensional global attractors and exponential attractors. Some stability results are also discussed.

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