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A two scale model for liquid phase epitaxy with elasticity

We study a two-scale model for liquid phase epitaxy with elasticity. The model has been derived via homogenization by formal asymptotic expansion in [2]. It consists of a macroscopic Navier-Stokes-System and a macroscopic convection-diffusion equation for the transport of matter in the liquid, and a microscopic problem that combines a phase-field approximation of a BCF-model, a Stokes system and an elasticity system for the growth and the elastic deformation of the solid film. On the micro-scale, the interface between the liquid and the solid domain is treated as a free boundary that can be described as the graph of the phase field. For each of these problems we proved in [3] the existence and uniqueness of solutions under the assumption that the coupling data are given, sufficiently regular functions. These results are a first step in the proof of the existence of solutions to the full model via a suitable fixpoint argument, applied to the composition of appropriate solution operators, as it has been done for a corresponding model without elasticity in [1].
[1] Ch.Eck, H.Emmerich: A two-scale model for liquid-phase epitaxy, Math. Methods Appl. Sci. 32(1),12-40, 2009. [2] Ch.Eck, H.Emmerich: Liquid-phase epitaxy with elasticity, Preprint 197, DFG SPP 1095, 2006. [3] Ch.Eck, M.Kutter: On the solvability of a two scale model for liquid phase epitaxy with elasticity, Preprint 2011/001, IANS, University of Stuttgart, 2011.