Existence of weak solutions to a Cahn–Hilliard–Biot system

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Abstract

We prove existence of weak solutions to a diffuse interface model describing the flow of a fluid through deformable porous media consisting of two phases. The system nonlinearly couples Biot's equations for poroelasticity, including phase-field dependent material properties, with the Cahn–Hilliard equation to model the evolution of the solid, and is further augmented by a visco-elastic regularization consistent with secondary consolidation. To obtain this result, we approximate the problem in two steps, where first a semi-Galerkin ansatz is employed to show existence of weak solutions to regularized systems, for which later on compactness arguments allow limit passage. Notably, existence of approximate solutions in the first step is reduced to a fixed-point problem and an application of maximal L^p-regularity theory in Bessel-potential spaces yields the regularity we require to pass to the limit.
This is a joint work with Helmut Abels and Harald Garcke.