# Existence results for a fourth order PDE arising in condensed matter physics

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We consider a partial differential equation that arises in the coarse-grained description of epitaxial growth processes. This is a parabolic equation whose evolution is dictated by the competition among the determinant of the Hessian matrix of the solution and the bilaplacian. We first show the existence of stationary solutions to this model for two different sets of boundary conditions: Dirichet and Navier. The proofs are different for the different sets of boundary conditions because the variational structure that is present in the Dirichlet problem is absent in the Navier one [1]. For solutions that are radially symmetric we recover the variational structure in both cases, and the proofs of existence of solutions are built making a explicit use of this fact [2]. Furthermore, in the case of radially symmetric solutions it is possible to prove non-existence of solutions for large enough data [3]. For the evolution problem it is possible to prove local existence of solutions for arbitrary data and global existence of solutions for small data. Depending on the boundary conditions and the concomitant presence of a variational structure in the equation as well as on the size of the data it is possible to prove blow-up of the solution in finite time and convergence to a stationary solution in the long time limit [4]. This talk is based on joint work with Filippo Gazzola, Robert Hakl, Ireneo Peral and Pedro J. Torres.

*References*

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