Some elliptic and parabolic problems of fourth order related to a variational epitaxial growth model

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We study a model related to *epitaxial growth* of crystals that involves equations of the type,

$$u_t + \Delta^2 u = \det\left(D^2 u\right) + \mu f(x,u), \quad x \in \Omega \subset \mathbb{R}^2,$$

Ω smooth bounded domain, $\mu \geq 0$ and with several boundary conditions.

We analyze the associated stationary equation and the evolution equation.

Motivated for the problem above, we will also review some results for equations of the type,

$$\Delta^2 u = S_2(\lambda_1(D^2 u), \lambda_2(D^2 u), ..., \lambda_N(D^2(u)) + \mu f(x,u), \quad x \in \Omega \subset \mathbb{R}^N,$$

where $\lambda_i(D_2 u)$ are the solution to the equation

$$\det\left(\lambda I - D^2 u\right) = 0,$$

that is, the eigenvalues of the hessian matrix of u and

$$S_2(\xi_1, ..., \xi_N) := \sum_{1 \leq i < j \leq N} \xi_i \xi_j.$$