

## Nonlocal Nonhomogeneous Phase transitions

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We provide a novel sharp-interface analysis via Gamma-convergence for a non-local and non-homogeneous diffuse-interface model for phase transitions, featuring an interplay between a non-local interaction kernel and a spatially dependent double-well potential. This interaction requires the development of new strategies both for the Gamma-liminf inequality and for the construction of recovery sequences. A key element of our approach is an asymptotic calibration, used to establish the Gamma-liminf lower bound. The study of the optimality of the lower bound hinges upon a novel analysis of the regularity dependence of one-dimensional optimal profiles on a family of parameters. In particular, we show how such regularity is influenced by the singularity of the interaction kernel at the origin, providing a precise and previously unexplored link between the two. Our results rely solely on the assumption of  $H^1$ -continuity for the moving wells, and also account for the compactness of sequences with equibounded energies. This is joint work with Emanuele Tasso.