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Energy minimizing patterns for a copolymer model with confinement

We identify the Γ -limit of an energy related to nanoparticle/block copolymer blends, in a limit of a large number of nanoparticles occupying a vanishingly small volume in the copolymer sample. The limiting energy consists of two terms: the perimeter of the interface separating the phases and a confinement term representing the effect of the nanoparticles, which attract one of the two stable phases. Our interest is in studying how the confinement term affects the phase transition morphology. We prove that local minimizers of the limiting energy admit regular phase boundaries and derive the first and second variations of the limiting energy functional. Finally we discuss possible critical and minimizing patterns in two dimensions and how these patterns vary from global minimizers of the purely local isoperimetric problem.