Abstract

Amphiphiles, such as lipids and functionalized polymers, plays a central role in the self-assembly of solvent accessible, intricately structured nano-scaled network structures, which are vital in cell functionality and offer wide applications to drug delivery, detergent production, emulsion stabilization and energy conversion devices. We study amphiphilic morphology in the framework of the functionalized Cahn-Hilliard (FCH) energy. The FCH is a continuum model accommodating various co-dimensional structures such as bilayers (co-dim 1), filaments (co-dim 2) and micelles (co-dim 3). We focus on defect structures that break the dimensional reduction and include endcaps that terminate filaments or bilayers and Y junctions. More specifically, we show the existence of pearled bilayer solutions via a spatial dynamics formulation, in combination with center manifold reduction and a fixed point argument. In addition, we also show via a functional analytic framework that in the presence of spatial inhomogeneity, localized undulation appears under proper functionalization terms. More interestingly, both the pearling and localized undulation are shown to be a manifesitation of a degenerate 1:1 resonance Hopf bifurcation encoded in a reduced ODE system from the

FCH energy.