Cyclic Symmetry Induced Pitchfork Bifurcations in the Diblock Copolymer Model

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The Ohta-Kawasaki model for diblock copolymers exhibits a rich equilibrium bifurcation structure. Even on one-dimensional base domains the bifurcation set is characterized by high levels of multi-stability and numerous secondary bifurcation points. Many of these bifurcations are of pitchfork type, and in previous work we showed that pitchfork bifurcations are induced by a simple even or odd symmetry-breaking and can be validated using computer assisted proof. However, this is not the complete picture: many other pitchfork bifurcations do not exhibit even or odd symmetry breaking. In the current work, we show that in these more involved cases, a cyclic group action is responsible for their existence, based on cyclic groups of even order. We present theoretical results establishing such bifurcation points and show that they can be characterized as nondegenerate solutions of a suitable extended nonlinear system, and show how these results can be validated using computer assisted proofs.

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