Bifurcation analysis of a mean-field model for biaxial nematics

F. Bisi[a], E.C. Gartland, Jr[b], E.G. Virga[a]

a Dipartimento di Matematica and CNISM, Università di Pavia, via Ferrata, 1, 27100 Pavia, Italy
b Department of Mathematical Sciences, Kent State University, Kent, Ohio 44242, USA

The interest for macroscopic biaxiality has been recently revived by the experimental evidence of thermally driven transitions to biaxial phases, promoted by newly synthesised nematogenic molecules(1). In particular, the interaction model proposed by Straley for molecules endowed with D_{2h} symmetry has been widely reconsidered. A mean-field model based on a quadrupolar approximation to the mean torque potential has proven capable of capturing the universal features characterising all phase diagrams compatible with the interaction model(2,3). Moreover, the phase sequences and the order of the transitions are weakly influenced by one of the interaction parameters(4).
Here we derive the analytical bifurcation equations underlying our numerical analysis; subsequently, we show how these equations are instrumental to the correct resolution of the mean-field model. Finally, we show different specific examples of the numerical code in which this rigorous analysis was implemented.

References

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