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Defect dynamics and ordering in compressible active nematics.[1]
PRASHANT MISHRA, Department of Physics, Syracuse University, PRAGYA SRIVASTAVA, The Francis Crick Institute, M. CRISTINA MARCHETTI, Department of Physics, Syracuse University — Active nematics, such as suspensions of biopolymers activated by molecular motors or bacteria swimming in passive liquid crystals, exhibit complex self-sustained flow, excitability and defect generation. Activity renders the defect themselves self-propelled particles, capable of organizing in emergent ordered structures. We have developed a minimal model of compressible active nematics on a substrate. We eliminate the flow velocity in favor of the nematic order parameter via the balance of frictional dissipation and active driving to obtain a dynamical description entirely in terms of the nematic alignment order parameter. Activity renormalizes the bend and splay elastic constants rendering them anisotropic and driving them to zero or even negative, resulting in the appearance of modulated states and defective structures. Using linear stability analysis and numerics we organize the various regimes into a phase diagram and discuss the relation to experiments.

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