

Instabilities and the Emergence of Topological Defects in Active Nematics

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Dynamic instabilities are widely observed in active nematic systems. This often leads to large-scale collective motion in active nematics. Here we would like to present interesting dynamical properties of two model active nematic systems when instabilities take place. In a toy active nematic system where the interaction only tends to align intersecting needle particles, we predict long-wave length instabilities and further show large-scale chaotic evolution in such system. We also use hard elliptic rods instead of penetrable toy needles to simulate active nematic state. We find the instability in deep nematic order is characterized by the active unbinding of topological defects. These defects behave very differently to non-active systems. We further reveal that their anomalous dynamics may lead to large-scale collective motions in such active granular system.