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Topological phase transitions of Active Brownian Particles under shear

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Active Brownian Particles (ABPs) are known to exhibit rich non-equilibrium behaviors.
The phase diagram shows two phase transitions: from a liquid state to a hexatic state, characterized by quasi-long-range orientational order and short-range translational order, and, at decreasing density, from a hexatic state to a solid state, where both orientational and translational order are quasi-long-range. These transitions are Kosterlitz-Thouless-like.
In this study, we want to study how this behaviour changes and whether the exponents of such transitions are still universal for a system of ABPs subjected to shear flow. By employing numerical simulations and theoretical analysis, we explore how anisotropic shear stress competes with active crystallisation, modifying the system's structural, dynamical and topological properties.
These results provide new insights into the properties of active crystalline phases, with potential implications in the design of new materials.

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