

SEARCHING FOR BIAXIAL NEMATIC LIQUID CRYSTALS: FROM COLLOIDS TO MOLECULES

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Liquid crystals are materials with properties between those of liquids and crystalline solids. They flow like liquids but have ordered spatial distributions, like crystalline structures. Nematic phases occur when this order is primarily orientational, with mesogens aligned along a common direction. More complex phases, such as smectic or columnar, form with positional order in one or two dimensions. Liquid crystals with mesogens of sophisticated geometries, like cuboidal or banana-shaped (biaxial), exhibit rich phase behavior predicted by theory and confirmed experimentally. Achieving agreement between predictions and observations is challenging, particularly for the biaxial nematic (N_B) phase. Colloidal cuboids show potential to form N_B liquid crystals. Theoretical studies predict stable biaxial nematics but often impose constraints that enhance N_B phase stability. We present simulation results elucidating conditions for N_B formation at the colloidal scale and extend these findings to explore biaxial nematics at the molecular scale.

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