

Torus-like solutions for the Landau-de Gennes model

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We study global minimizers of a continuum Landau-De Gennes energy functional for nematic liquid crystals in three-dimensional domains, possibly in a restricted class of axisymmetric configurations. Assuming smooth and uniaxial (e.g. homeotropic) boundary conditions and a corresponding physically relevant norm constraint (Lyuksyutov constraint) in the interior, we discuss partial regularity of the minimizers away from a possible finite set of interior singularities lying on the symmetry axis or even full regularity when no symmetry is imposed. As a consequence, we discuss boundary data which yield as minimizers smooth configuration with maximally biaxial set carrying nontrivial topology. In the axially symmetric case we show how singular (split) solutions or smooth (torus) solutions (or even both) for the Euler-Lagrange equations do appear for boundary data and/or domains which are smooth deformation of the radial hedgehog in a nematic droplet.