2D NEMATIC LIQUID CRYSTALS

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Nematic liquid crystals are aggregates of rodlike molecules that tend to align parallel to each other along a given direction. Due to their easy response to externally applied electric, magnetic, optical, and surface fields, nematic liquid crystals are of greatest potential for scientific and technological applications. Currently there is an increasing interest in soft matter physics on small spherical colloidal particles or droplets coated with a thin layer of nematic liquid crystal. The hope is to build mesoatoms with controllable valence. These coating layers are called *nematic shells*. In these lectures a continuum model to describe the molecular alignment in thin nematic shells will be proposed. By contrast with previous accounts, the two-dimensional free energy will not be postulated, but deduced from the conventional three-dimensional Frank model.

1. Differential geometry of nematic shells

This lecture will introduce the surface differential operators and the basic results on the geometry of nematic shells which are fundamental in deriving models for the free energy of a thin layer of liquid crystal coating a curved surface.

2. Equilibrium of nematic shells

A variational scheme which allows the derivation of a concise and elegant formulation of the equilibrium equations for nematic shells will be introduced. The only constitutive ingredient in this scheme is a free-energy density which depends on the geometry of the shell and the director field.

3. Two-dimensional director theory

In this lecture it will be showed how the classical Frank formula for the free energy of a nematic liquid crystal reduces when the nematic molecules, confined within a thin region, align parallel to an underlying surface.

Bibliographical material

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