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Lattice model for biaxial and uniaxial nematic liquid crystals

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We use a lattice gas model to describe the phase transitions in nematic liquid crystals. The phase diagram displays, in addition to the isotropic phase, the two uniaxial nematics, the rod-like and discotic nematics, and the biaxial nematic. Each site of the lattice has a constituent unit that takes only six orientations and is understood as being a parallelepiped brick with the three axes distinct. The possible orientations of a brick are those in which its axes are parallel to the axes of a Cartesian reference frame. The analysis of the model is performed by the use of a mean-field approximation and a Landau expansion of the free energy.

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