

## Modelling liquid crystals at mesoscopic scale: structure and light

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Modelling of liquid crystals at mesoscale is today a strong predictive and explanatory approach for designing and developing various liquid crystalline materials and structures, including their dynamics. In this tutorial, I will present an introduction to mesoscopic continuum modelling of nematic, based on free energy minimization and solving nematodynamic equations. From the perspective of modelling, I will comment on the order parameters in the nematic systems, role of different free energy or stress tensor contributions, topological defects, visualization and advantages/disadvantages of different numerical methods. Also I will discuss briefly two selected methods for modelling of light in liquid crystals at the wavelength scale: finite difference time domain and finite difference frequency domain method. The use of above methods will be illustrated on selected examples of nematic colloids, active nematics, topological structures and nematic metamaterials.

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