Controlling defects with electric fields

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Liquid crystals continue to provide promising prospects for the development of novel devices, sensors, optical elements and metamaterials [1, 2]. This potential relies upon the ability to robustly and reliably create and control the molecular configuration over large regions of the material. One way of doing this is to generate and manipulate topological defects in the material, either through the addition of colloidal inclusions or topographical surface patterning [3, 4]. By their nature topological defects provide robustness for the textures they generate and a means to influence material properties over large distances, so that they offer considerable promise for novel technologies. But the realisation of their full potential depends on both the ability to generate appropriate defect arrangements and to manipulate them, allowing for rapid switching between different configurations. This project will consider this latter facet by studying the response of colloidal defect assemblies to applied electric fields, through both dielectric and flexoelectric couplings, and surface anchoring patterning. This will involve the extension and development of an existing c++ code for simulating liquid crystals at the mesoscale.

References

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