Taming Complex Fluids with external field: a computational journey

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Abstract
Thermal and electromagnetic fields induce a range of non-equilibrium effects in complex fluids consisting of nanoparticle suspensions (e.g., Soret, Seebeck, Peltier effects), which can be exploited in energy conversion (thermoelectrics), analytical devices for detection of biomolecules, or nanoparticle transport and assembly. The combination of non-Equilibrium multiscale simulations and non-equilibrium theory has paved the way to elucidate the physical behaviour of complex fluids under external fields, showing that their response is much richer than previously anticipated. I will discuss the use of these techniques to predict and observe novel non-equilibrium effects in complex fluids and to quantify the impact of confinement on heat and mass transport, hence opening new avenues for energy conversion and tuneable nano-tribology.

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