Modeling of coupled systems of complex fluids and solids using phase fields

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ABSTRACT

There is a large body of literature dealing with the interaction of solids and classical fluids [1], but the interaction of solids and complex fluids remains practically unexplored, at least from the computational point of view.

Complex fluid is a broad term used to describe, for example, multi-component or multi-phase fluid mixtures, emulsions or foams. Complex fluids produce much richer physics than classical fluids when they interact with solids, especially at small scales. In this presentation, I will illustrate this point by studying several physical phenomena in which the interaction of complex fluids and solids plays a key role, such as, for example, phase-change-driven implosion.

From a methodological point of view, I will use a phase-field model to describe the complex fluid, and classical nonlinear hyperelasticity to model the solid. Our computational framework is based on Isogeometric Analysis [2], which allows for a straightforward discretization of the higher-order partial differential operators typically present in complex-fluid theories [3,4].

REFERENCES

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