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Simulation and control of multiphase flows governed by the Cahn-Hilliard Navier-Stokes system (CHNSS)

(joint with M. Hintermüller and C. Kahle)

In the first part of the talk we consider multiphase flow governed by the CHNSS in the phase field approximation with the double obstacle potential, and apply a semi-implicit scheme to its time discretization. We relax the variational inequalities appearing in every time step by a penalization approach and develop reliable and effective residual based a posteriori error estimators for the resulting PDE system along the lines of [1]. In the second part of the talk we develop a model predictive feedback control strategy. Several numerical experiments show the performance of our approach. The work presented in the first part extends the investigations of [1] on adaptivity for the Cahn Hilliard system to the CHNSS.

[1] M. Hintermüller, M. Hinze, C. Kahle: An adaptive finite element Moreau-Yosida-based solver for a non-smooth Cahn-Hilliard problem. *Optim. Meth. Software* 26:777-811 (2011)