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# Upscaling of a Cahn–Hilliard Navier–Stokes Model including Precipitation in a Thin Strip

*Tuesday, 1 June 2021 11:45 (15 minutes)*

Multiphase flow and reactive transport are important in many applications, in particular in porous media. We consider the incompressible flow of two immiscible fluids in the presence of a solid phase changing due to precipitation and dissolution. We employ a ternary phase-field model on the pore scale, extending widespread models for two fluid phases by including a solid phase.
We upscale this model in the geometry of a thin strip. In the context of porous media the thin strip can be seen as the representation of a single pore throat. For scale separation we introduce $\beta$ as the ratio between width and length of the strip. Using asymptotic expansions we investigate $\beta \to 0$ under moderate assumptions on Peclet number and Capillary number. The resulting multi-scale model consists of upscaled equations for total flux and ion transport, while the phase field equation has to be solved in cell-problems on the pore scale to determine the position of interfaces.
We also investigate the sharp interface limit of the multi-scale model. Here the diffuse interface width $\varepsilon$ approaches zero and a sharp interface model is recovered. The resulting model consists only of Darcy-scale equations, as the cell-problems can be solved explicitly. The model is of hyperbolic nature, and we use numerical results to investigate the validity of the upscaling when discontinuities form in the upscaled model.

## Time Block Preference

Time Block A (09:00-12:00 CET)

## References

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