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Anisotropic Adaptive Finite Elements for a p-Laplace Like Problem. An Application to Aluminium Electrolysis

Simulating Aluminium Electrolysis is a complex multi-scale and multi-physics task. Here we are interested in the fluid-flow problem describing the movements of liquid aluminium and electrolytic bath. In order to find a trade off between computational time and accuracy, Adaptive Finite Elements with large aspect ratio are considered. As a test case the p-Laplacian like problem $-\nabla \cdot ((\mu + |\nabla u|^{p-2})\nabla u) = f$, when $\mu \geq 0$ and $p \geq 2$ is considered. Using the anisotropic setting of [1, 2] and the quasi-norm techniques in [3], an anisotropic a posteriori error estimate is proved. A mesh adaptive strategy is presented. Numerical experiments show the sharpness of the estimator on both fixed and adapted meshes. Finally the developed strategy is applied to Aluminium Electrolysis.

References

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