

# EFFICIENT SOLUTION OF A METAL CORROSION MODEL

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Preventing corrosion damages is paramount for the conservation of historical metal artefacts. The development of mathematical tools and computational experiments can enhance the comprehension and control of corrosive phenomena, which is crucial for devising new techniques for material protection and predictive maintenance.

Metal surfaces are usually covered by a protective film. However, this film may locally break, causing an exposure of the metal to the environment that may result in a localized corrosion attack known as pitting corrosion.

In this talk we consider a phase field model for pitting corrosion [3]. Phase field models allow for a simple treatment of moving interfaces, but the equations to be solved are highly stiff and their efficient solution is challenging.

We present a new numerical approach for the solution of this problem, based on an efficient time integrator for the stiff system of ODEs obtained from a finite difference space discretization. We consider some benchmark problems to compare the efficiency and accuracy of the new approach with other techniques from the literature [1, 2].

## References

- [1] D. Conte, G. Frasca-Caccia, *A Matlab code for the computational solution of a phase field model for pitting corrosion.*, Dolomites Research Notes on Approximation, 15.2 (2022), pp. 47–65.
- [2] H. Gao, L. Ju, R. Duddu, H. Li, *An efficient second-order linear scheme for the phase field model of corrosive dissolution*, Journal of Computational and Applied Mathematics, 367 (2020), 112472
- [3] W. Mai, S. Soghrati, R. G. Buchheit, *A phase field model for simulating the pitting corrosion*, Corrosion Science, 110 (2016), pp. 157–166.