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Two Dimensional Hydrogen Fuel Cell: Channel Optimal Shape Design

We consider a two dimensional model of dry hydrogen fuel cell, the cathode side. This part of the cell involves two layers: the air channel and the graphite diffusive layer. Our objective is to find the optimal shape of the air channel such that the following constraints are met:

1. The oxygen distribution is uniform on the cathode membrane,
2. The total oxygen is maximized on the cathode membrane.

We achieve this goal by implementing shape calculus and the adjoint method.