# An Iterative Method for Shape Optimal Design of Stokes-Brinkmann Equations with Heat Transfer Model

Wenjing Yan[1], Feifei Jing[2], Jiangyong Hou[3], Zhiming Gao[4], and Nannan Zheng[1]

[1]Xi'an Jiaotong University
[2]Northwestern Polytechnical University
[3]Northwest University
[4]Institute of Applied Physics and Computational Mathematics

April 28, 2020



**Abstract**

This work is concerned with the shape optimal design of an obstacle immersed in the Stokes-Brinkmann fluid, which is also coupled with a thermal model in the bounded domain. The shape optimal problem is formulated and analyzed based on the framework of the continuous adjoint method, with the advantage that the cost of computing the gradients and sensitivities is independent of the number of design variables. Then, the velocity method is utilized to describe the domain deformation, and the structure of Eulerian derivative with respect to the shape of the variable domain for a cost functional is established by applying the differentiability of a minimax problem based on the function space parametrization technique. Moreover, an iterative algorithm is proposed to optimize the boundary of the obstacle in order to reduce the total dissipation energy. Finally, numerical examples are presented to illustrate the feasibility and effectiveness of our method.

**Hosted file**

An Iterative Method for Shape  Optimal Design of Stokes-Brinkmann Equations with Heat Transfer Model.pdf
available at https://authorea.com/users/312583/articles/443145-an-iterative-method-for-shape-optimal-design-of-stokes-brinkmann-equations-with-heat-transfer-model