Postdoctoral Multiphysics Topology Optimization for the Development of Fuel Cell End Plates 25PDR322
University of São Paulo

Job Title Postdoctoral Multiphysics Topology Optimization for the Development of Fuel Cell End Plates 25PDR322

Department Mechatronics and Mechanical Systems Engineering
https://sites.usp.br/rcgi/

Institution University of São Paulo
São Paulo, São Paulo, Brazil

Date Posted Sep. 19, 2025

Application Deadline Oct. 18, 2025

Position Start Date Nov. 1, 2025

Job Categories Post-Doc

Academic Field(s) Mechatronics
Engineering - Other

Job Website https://sites.usp.br/rcgi/opportunities/

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Job Description

Research theme area:
Optimization of end-plates of fuel cells through topology optimization methods, with an emphasis on integrating stress, displacement, and temperature constraints to improve efficiency and durability.

Abstract:
The candidate will collaborate with researchers from the Research and Development (R&D) project SOFC – The Future of Ethanol in the Transportation Sector, at Polytechnic School of the University of São Paulo. Summary of the program and projects can be found at the RCGI website (https://sites.usp.br/rcgi/).
One of the research lines of this project is dedicated to the development and optimization of end plates, critical structural components that ensure the integrity and efficiency of fuel cells. The main objective of this work is to develop a computational model for the topology optimization of these end plates. The optimization problem focuses on minimizing the volume, subject to multiphysics constraints that ensure structural integrity, uniform pressure distribution, and thermal management. To address a gap in the literature, the model incorporates local constraints for stress, displacement, and temperature, enforced via the Augmented Lagrangian method, in addition to global constraints for mechanical and thermal compliance. The proposed methodology aims to enhance the mechanical and thermal performance of the end plates, resulting in significant mass reduction, which is crucial for mobility applications. The optimized topologies will undergo post-processing and experimental validation to verify the results.

Description:
The candidate will contribute in line with the main objectives of the projects:

1. Develop and optimize end plates for SOFCs using multiphysics topology optimization, aiming to ensure structural integrity, uniform pressure distribution, and efficient thermal management under high-temperature operational conditions (500-1000°C).
2. Implement and validate an advanced computational framework incorporating local constraints (stress, displacement, temperature) via the Augmented Lagrangian method and global compliance constraints, applying coupled thermomechanical simulations to predict performance in real scenarios.
3. Manufacture and test prototypes of optimized end plates using additive manufacturing, experimentally validating their mechanical, thermal, and electrochemical performance under operational conditions, including thermal cycling and exposure to reducing and oxidizing

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atmospheres.

Requirements to fill the position:
This project is suitable for a highly motivated candidate and requires programming skills in Python, experience in computational mechanics, numerical optimization methods and proficiency in English are required. Experience with the finite element method and with the simulation of multiphysics systems is not required, but will be considered in the evaluation.
- The candidate should hold a PhD in Mechanical Engineering or in related fields, with the skills described above.

INFORMATION ABOUT FELLOWSHIP:
This Postdoc fellowship is funded by FAPESP. The fellowship will cover a standard maintenance stipend of R$ 12,570.00 per month.

MORE INFORMATION:
https://sites.usp.br/rcgi/opportunities/
Position: **Post-Doctoral Fellowship REF.: 25PDR322**

Access here AND APPLICATION AT REF**Post-Doctoral REF.: 25PDR322**

Contact Information

Please reference Academickeys in your cover letter when applying for or inquiring about this job announcement.

Contact RCGI
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