



Postdoctoral Research Position in Hydrogen Storage & Computational Multiphysics

Location

CORIA – INSA Rouen Normandie, Rouen, France

Project Summary

The HyLBM project aims to advance next-generation hydrogen storage technologies through the development of a high-fidelity computational framework dedicated to nanostructured metal hydride reactors. Despite their high volumetric hydrogen storage capacity and intrinsic safety advantages, metal hydrides still face critical limitations related to slow sorption kinetics, poor thermal conductivity, and complex coupled multiphysics phenomena occurring across multiple scales. HyLBM addresses these challenges by developing a pore-scale and multiscale numerical platform based on the Lattice Boltzmann Method (LBM), capable of resolving coupled heat transfer, mass transport, hydrogen absorption/desorption reactions, and transient thermal effects inside realistic porous structures. The project combines advanced numerical modeling, GPU-accelerated high-performance computing, image-based porous media reconstruction, and machine learning-assisted optimization to improve the design, thermal management, and operational efficiency of compact hydrogen storage systems for energy and mobility applications.

Project Objectives

The main objective of HyLBM is to establish a predictive and scalable simulation framework capable of linking nano-scale transport phenomena to full-reactor hydrogen storage performance. The project seeks to develop advanced LBM solvers for coupled reactive heat and mass transfer in metal hydrides, investigate the effects of nanoconfinement, particle morphology, thermal gradients, and material structuring on hydrogen sorption kinetics and cycling stability, validate the numerical framework using experimental and literature benchmark data, and derive optimized reactor designs with enhanced thermal management and faster dynamic response. Ultimately, HyLBM aims to support the deployment of safer, more efficient, and industrially viable hydrogen storage technologies aligned with Europe's clean energy transition goals.

Candidate Profile

We are looking for a highly motivated candidate with expertise in CFD, Lattice Boltzmann Method (LBM), heat and mass transfer, multiphase flows, reactive transport modeling, HPC/GPU computing, machine learning for scientific computing, and scientific programming (C++, Python, CUDA). Experience in hydrogen systems, porous media, or energy-related simulations is considered a strong advantage.

Research Environment

The successful candidate will join a dynamic multidisciplinary research environment with access to large-scale HPC infrastructures, GPU-accelerated simulation platforms, advanced open-source computational tools, and international academic and industrial collaborations.

Application Procedure

Applicants are invited to send a detailed CV, 2 recommendation letters, a short motivation letter, and the list of their publications to: msshadloo@coria.fr