

Master internship position at IFP Energies nouvelles (IFPEN) *In Environmental microbiology*

Towards a better understanding of subsurface microbial hydrogenotrophic activities using synthetic consortia

Intermittent renewable energies such as wind turbines and solar panels can produce electricity in excess. A promising technical solution to deal with this surplus consists in converting electricity into “green” hydrogen (H₂) through electrolysis and to store produced H₂ in geological formations. Compared to surface storage, underground hydrogen storage (UHS) in geological formations has numerous benefits: a huge storage space, safety brought by the solid caprock seal, lower cost than large-scale surface tanks, and high availability in existing underground storage sites. Due to its high reactivity and mobility, the major risk associated with UHS is the consumption of H₂ by subsurface microorganisms. Hydrogenotrophic populations can use H₂ in their metabolism and thus may lead to a variety of undesired side effects such as H₂ loss, H₂S formation, methane formation, acid formation, clogging and corrosion. H₂ reactivity questions the capacity of these systems to keep the quantity and composition of the gas injected during seasonal injection / withdrawal cycles. In this context, this internship focuses the characterization of hydrogenotrophic microbial populations in H₂-rich deep environments using cultivation methods. Besides, it will focus on pure cultures and synthetic consortia consisting of methanogenic archaea, sulfate-reducing and homoacetogenic bacteria representative of deep surface environments. Abiotic factors such as salinity, temperature and substrate concentration will be modulated to assess the sensitivity of kinetics parameters. Microbial populations will be monitored using molecular biology techniques (qPCR) and microscopy. These data enable the development of synthetic hydrogenotrophic microbial consortia and numerical simulations to study and model their activity.

This internship is funded by the EU HorizonTWINN2SET project led by FORTH/IG (Chania, Greece).

Keywords: Hydrogen, UHS, anaerobic cultivation, qPCR

Location	IFP Energies nouvelles, Rueil-Malmaison, France
Duration and start date	6 months, February-July 2024
Employer	IFP Energies nouvelles, Rueil-Malmaison, France
Academic requirements	Bachelor degree in microbiology
Language requirements	Fluency in French or English
Other requirements	Knowledge in microbiology, anaerobic cultures
IFPEN supervisor	Ph.D. POIRIER Simon, Biotechnology department, simon.poirier@ifpen.fr , ORCID: 0000-0003-0669-5117
FORTH/IG supervisors	Evina Gontikaki, Institute of Geoenergy, Foundation for Research and Technology – Hellas, egontikaki@ig.forth.gr Manos Stamatakis, Institute of Geoenergy, Foundation for Research and Technology – Hellas, estamatakis@ig.forth.gr

To apply, please send your cover letter and CV to both IFPEN and FORTH/IG supervisors indicated here above by Friday 10th of November 2023.

About IFP Energies nouvelles

IFP Energies nouvelles is a French public-sector research, innovation and training center. Its mission is to develop efficient, economical, clean and sustainable technologies in the fields of energy, transport and the environment. For more information, see [our WEB site](#).

IFPEN offers a stimulating research environment, with access to first in class laboratory infrastructures and computing facilities.