

**Master 2 internship project
Year 2025-2026**

Laboratory/Institute: LCBM
Team: BEE

Director: Vincent ARTERO
Head of the team: Christine CAVAZZA

Name and status of the scientist in charge of the project: Julien PERARD IRHC

HDR: yes ☐ no ☒

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Program of the Master's degree in Biology:

☒ Microbiology, Infectious Diseases and Immunology ☒ Biochemistry & Structure
☐ Physiology, Epigenetics, Differentiation, Cancer ☐ Neurosciences and Neurobiology

Title of the project: Investigating the effects of light source on green Hydrogen production from waste using Purple Non-Sulfur Bacteria (PNSB).

Objectives: Optimizing Light Conditions for Maximum Hydrogen Production. Determining the most effective light source for maximizing hydrogen production. Investigating the efficiency of different types of waste materials for hydrogen production through photofermentation.

Abstract: This project focuses on converting solid waste into biohydrogen, a clean and renewable energy source, via photofermentation. Photosynthetic PNSB organisms are used to convert the organic matter present in solid waste into hydrogen gas. The project's primary goal is to optimize the photofermentation process to maximize the yield of biohydrogen, particularly from lactoserum and industrial sugar waste. The impact of various conditions, including light intensity, temperature and pH, on biohydrogen production will be evaluated. Gas chromatography will be used to measure the produced hydrogen, and the composition of the waste materials will be analyzed using high-performance liquid chromatography (HPLC) and enzymatic methods. The ultimate goal of this project is to identify the optimal conditions for photofermentation in order to maximize biohydrogen yield.

Methods: Optimization of the growth conditions for hydrogen by photo-fermentation. Monitoring and analysis of the performance of the photobioreactor with GC (gas composition) HPLC and enzymatic dosage for substrate conversion to products.

Up to 3 relevant publications of the team:

-From two-component enzyme complex to nanobiohybrid for energy-efficient water-gas shift reaction. Pichon Thomas; Righetti Claudio; Pérard Julien; Le Goff Alan; Cavazza Christine*. Chemical Science. (2025).
-Development of a CO₂-biomethanation reactor for producing methane from green H₂. G Cwicklinski, R Miras, J Pérard, C Rinaldi, E Darrouzet, C Cavazza*. Sustainable Energy & Fuels 8 (5), 1068-1076 (2024).
-Replacing incandescent lamps with an LED panel for hydrogen production by photofermentation: Visible and NIR wavelength requirements. Violette Turon, Zoé Anxionnaz-Minvielle, John C. Willison. International Journal of Hydrogen Energy, Volume 43, Issue 16, 2018,

Requested domains of expertise: Microbiology, Biochemistry, biochemical analysis