

MicroH2Prod - Towards microbial conversion of methane into hydrogen

Marie Noguier, Yannick Combet-Blanc Sylvain Davidson, Bernard Ollivier, Jean Borgomano et
Alain Dolla

Keywords: Biohydrogen, Methanotrophy, Bioprocess Engineering, Fermentation

Kalyuzhnaya et al. (2013) brought to light the remarkable capacity of methanotrophic bacteria to ferment methane into organic acids and hydrogen under low-oxygen conditions [1]. Notably, recent research has revealed the presence of methanotrophic bacteria, belonging to the *Methylococcus* and *Methylobacterium* genera in subsurface aquifers, commonly associated with gas storage facilities [2]. These discoveries prompt a fundamental question: Could microorganisms inhabiting gas reservoirs serve as biocatalysts for the transformation of methane into hydrogen?

The MicroH2Prod project is dedicated to investigating and optimizing a bioprocess for methane-to-hydrogen conversion under mild pressure and temperature conditions. This study leverages laboratory-scale instrumented bioreactors. We have selected methanotrophic marine microorganisms for their inherent potential to transform methane into hydrogen and assumed compatibility with natural gas reservoir conditions. Our optimization strategy hinges on precise control of medium oxygenation levels and the supply of trace metal elements, essential factors to drive methane conversion into hydrogen.

Références

- [1] M. G. Kalyuzhnaya et al., « Highly efficient methane biocatalysis revealed in a methanotrophic bacterium », *Nat Commun*, vol. 4, no 1, p. 2785, déc. 2013, doi: 10.1038/ncomms3785.
- [2] T. N. Nazina et al., « Diversity and Possible Activity of Microorganisms in Underground Gas Storage Aquifers », *Microbiology*, vol. 90, no 5, p. 621-631, 2021.

Marie Noguier
AKKODIS
marie.noguier@akkodis.com

Yannick Combet-Blanc Sylvain Davidson, Bernard Ollivier, Jean Borgomano
Aix-Marseille Université, IRD
Institut Méditerranéen d'Océanologie, OSU Institut Pythéas
yannick.combet-blanc@mio.osupytheas.fr

Jean Borgomano
Aix-Marseille Université, IRD, OSU Institut Pythéas, CNRS, CEREGE UM 34, Collège de France,
INRAE

Alain Dolla
Aix-Marseille Université, Institut Méditerranéen d'Océanologie, OSU Institut Pythéas, CNRS
alain.dolla@mio.osupytheas.fr