

Deep underground methanogenesis for recycling CO2

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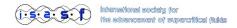
Emeline Vidal, Anaïs Cario, Cyrielle Fauveau, Carole Lecoutre, Yves Garrabos, et al.. Deep underground methanogenesis for recycling CO2. 18th European Meeting on Supercritical Fluids, International Society for the Advancement of Supercritical Fluids, May 2021, Visioconférence, France. pp.1-2. hal-04595637

HAL Id: hal-04595637

https://hal.science/hal-04595637

Submitted on 31 May 2024

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PROCEEDINGS

CONFERENCE SCOPE

The objective of the meeting is to gather together all the members of the supercritical fluid community and to give the opportunity to academic researchers and industrial practitioners to provide a complete and critical up-date on all the current technologies using Supercritical Fluids, their different applications as well as the latest innovations being developed.











INVITED	KEYNOTES	<u>ORALS</u>	<u>POSTERS</u>

Deep underground methanogenesis for recycling CO₂

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The dramatic increase of anthropogenic greenhouse gases concentrations in the atmosphere threatens the ecosystems equilibrium, including our way of life. The development of sustainable technologies in the frame of mitigation efforts to reduce anthropogenic CO_2 emissions remains an urgent need. A promising strategy consists in storing the CO_2 in deep geological formations, like deep saline aquifers, where it could be used as a raw material by endemic microbes. Far from being anecdotal, the transformation of part of the stored CO_2 into methane would lower the costs of capture and storage.

Deep saline aquifers are porous environments, with temperature ranging between 40°C to 100°C and hydrostatic pressure up to 150 bar. Methanogens, and more particularly hydrogenotrophic methanogens, which can transform CO_2 and H_2 into methane $(CO_2 + 4 H_2 \rightarrow CH_4 + 2 H_2O)$, are part of the microbial population living in such environments. Using their metabolisms would allow considering deep saline aquifers as macro bioreactors for an upgrading process of CO₂ to methane (Fig. 1)⁽¹⁾. However, little is known about their response to a high CO₂ injection (2). Therefore, we are investigating in here methanogenesis reaction in these conditions, with а model strain, thermolithotrophicus (3), in order to determine the key parameters to improve the CO₂ recycling potential. We have developed multiscale high pressure approaches (microfluidics⁽⁴⁾ and millifluidics) to investigate this biochemical reaction at lab scale, allowing to mimic deep environments.

The tools and approaches that we are developing and using will make it possible to simulate these deep ecosystems, to estimate the yields of such approaches and the possibility of testing exploitation scenarios.



Figure 1: Deep underground CO₂ bioconversion

Acknowledgments: This project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation program under grant agreement No 725100.

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