Università degli Studi di Napoli Federico II

PhD in Biotechnology - 39th cycle

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Impact of subsurface microbiology on hydrogen storage and reservoir storage efficiency

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The harmful effects and costs of greenhouse gasses and the rise in demand for energy are encouraging many actors in the energy field to reduce or even eliminate the use of fossil fuels in favor of renewable sources. Hydrogen is being prioritized for being a good energy carrier due to its high energy density and no contamination in the electricity generation process, yielding water as a byproduct (Yue et al. 2021), among other advantages. Consequently, underground hydrogen storage (UHS) has been receiving increasing interest thanks to its potential to facilitate the transition to a low carbon-emitting society (Dopffel et al. 2021, Miocic et al. 2023). The process combines the generation of molecular hydrogen from water using renewable energies and the storage of the gas in underground reservoirs to supply peaks in demand. However, these subsurface systems may contain rich microbial communities (Amils et al. 2023, Fullerton et al. 2021, Magnabosco et al. 2018) that can not only consume the stored hydrogen but generate harmful byproducts, such as hydrogen sulfide (Gregory et al. 2019), which can corrode the metal infrastructure. It is therefore critical to assess the potential risks of these communities that can jeopardize the stability of the stored hydrogen gas and of the whole UHS process. By collecting and storing data from different sampling expeditions in a database, studying key microbial species and creating metabolic models at the species and community level, we hope to better understand the impact of these microbial communities and to provide a risk assessment for future storage sites.

References

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