



## CO<sub>2</sub> Storage in Sediments by Hydrate Formation and Self-Preservation in the Presence of Promoters

Pandey, Jyoti Shanker; Daas, Yousef Jouljamal; von Solms, Nicolas

*Publication date:*  
2020

*Document Version*  
Peer reviewed version

[Link back to DTU Orbit](#)

*Citation (APA):*

Pandey, J. S., Daas, Y. J., & von Solms, N. (2020). *CO<sub>2</sub> Storage in Sediments by Hydrate Formation and Self-Preservation in the Presence of Promoters*. Abstract from AAPG Europe Regional Conference 2020, Athens, Greece.

---

### General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

# CO<sub>2</sub> Storage in Sediments by Hydrate Formation and Self-Preservation in the Presence of Promoters

**Jyoti Shanker Pandey, Yousef Jouljamal Daas, and Nicolas von Solms\***

Center for Energy Resource Engineering (CERE), Department of Chemical Engineering, Technical University of Denmark, Lyngby 2800, Denmark

Correspondence: nvs@kt.dtu.dk; Tel.: +45-45252867

Carbon storage in the geological setting is seen as a useful technique to mitigate the impact of climate change. When CO<sub>2</sub> is injected into sediments, at a specific pressure and temperature range, CO<sub>2</sub> hydrate can be formed as a by-product, which could act as a seal against the possible leaking of CO<sub>2</sub> over an extended period. CO<sub>2</sub> hydrate formation can be accelerated in the presence of certain chemicals known as hydrate promoters. Effect of these promoters on hydrate self-preservation tendency is also noteworthy for studies.

This study discusses the formation behavior of CO<sub>2</sub> hydrate in sediment and quantifies the kinetics of hydrate formation, and self-preservation in the form of induction time, gas uptake. Critical parameters studied include the change in sediment particle size, type of hydrate promoter, volume of hydrate promoter, is studied, and comparative analysis of selected promoters are carried out about the water. Experiments are carried out in high pressure, low-pressure environment using high-pressure apparatus.

Additionally, self-preservation effect of CO<sub>2</sub> hydrate is also studied at a temperature between 269K - 272K. Hydrate promoter selected in this study includes surfactant sodium dodecyl sulfate (SDS) and amino acids, L-valine, L-methionine, L-histidine, and concentration equal to 3000 ppm for all. Amino acids are seen as a potential replacement for toxic surfactant such as SDS for CO<sub>2</sub> capture & storage application due to their environment-friendly nature.

Results indicate that at starting pressure 60-62 bars, and initial temperature between 274-275K, CO<sub>2</sub> hydrate forms instantaneously in sediments within 1 min. Nucleation time for hydrate formation is found to be highest for SDS, L-valine and L methionine whereas slowest for L histidine. As sediment particle size increases, hydrate formation time decreases. Presence of hydrate promoter within sediments found to have minimal effect on self-preservation except in case of L-methionine, which showed weakest self-preservation effect. Obtained results are expected to provide an enhanced understanding of industrial-scale CO<sub>2</sub> capture and storage in geological formation in the presence of hydrate promoter.