



## **Kinetics of Hydrate Formation in the System CO<sub>2</sub>-NaCl and H<sub>2</sub>O**

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Hydrates are well known in the oil and gas industry for causing unexpected clogging problems because of their rapid crystallization behavior. A formation of hydrates is also possible during the injection of CO<sub>2</sub> into depleted low-pressure gas fields where they would form in the near wellbore area. Even though this process is reversible it would temporarily cause a significant reduction of the injectivity.

Hydrates are ice-like structures that capsule gas molecules inside water cages stabilized by hydrogen bonding. It is well known that the formation of hydrates is strongly dependent on temperature and pressure conditions. This study is the starting point to investigate the downhole hydrate formation risk on a laboratory scale. To simulate these conditions we use a stirred high-pressure autoclave with a connected high-resolution video camera for visual observation. We analyze the formation kinetics of CO<sub>2</sub> hydrates in the bulk system CO<sub>2</sub>-H<sub>2</sub>O-NaCl with regard to the physical condition of the guest molecule. It is known that hydrates show a metastable behavior before the formation starts. The length of this metastability period is strongly influencing the hydrate formation speed. Besides pressure as a main driving force for the kinetics, the phase condition seems to play a major role to reduce the metastability of the whole system. We will present new results on the formation behavior and the metastability of the hydrate formation system.