



Simultaneous water desalination and CO₂ capturing by hydrate formation

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Received 1 March 2009; Accepted 1 July 2010

ABSTRACT

Stabilizing CO₂ concentration in the atmosphere is vital because of the increasing rate of using fossil fuels in the industries and buildings for heating purposes. Further, shortage of potable water in most of the world needs cheap and efficient methods for desalination of seawater. CO₂ hydrate is a good solution for both problems. By CO₂ hydrate formation in the presence of seawater, CO₂ is captured and stored in a safe place. Then it is decomposed to carbon dioxide and desalinated water where they are desired. Afterward, desalinated water is consumed by any leaving thing and CO₂ is consumed by plants. In this study, CO₂ hydrate is formed at 2.5–4.5 MPa and 0–8°C in a 5 l semi-batch reactor in the presence of synthetic saline waters and Persian Gulf water. In all experiments, two stages of CO₂ dissolution and hydrate formation are observed. After ending hydrate formation, pressure is released and temperature is gradually increased to take effect the decomposition. The salinity of the produced water is measured and compared to raw water salinity to define the efficiency of the separation. The separation efficiencies of the dissolved solids are measured about 6–52% in most of the experiments.

Keywords: Batch reactor; Capture; CO₂ hydrate; Kinetics; Sequestration

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