

Phase equilibria and kinetic behaviors of HFC-125a hydrate in NaCl solutions for application in desalination

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Hydrate-based desalination has been considered a promising method because highly concentrated solutions can be treated more effectively than other desalination processes. In the hydrate-based desalination, appropriate hydrate-forming substances should be chosen to operate the process in milder pressure and temperature conditions for economic competitiveness. In this study, HFC-125a was investigated as a hydrate-forming substance. Three-phase (hydrate-liquid water-vapor) equilibria of HFC-125a hydrate in NaCl solutions (3.5 and 8 wt%) were determined to verify the influence of NaCl on the thermodynamic hydrate stability. The crystalline structure of the HFC-125a hydrate was identified as a sII using powder X-ray diffraction. The hydrate growth pattern and formation rate were measured using in-situ Raman spectroscopy. A high pressure differential scanning calorimeter was adopted to examine the influence of NaCl on hydrate dissociation enthalpy. The experimental results in this study can be used as fundamental data for the HFC-125a hydrate-based desalination process.