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Thermodynamic and kinetic investigations of cyclopentane hydrates in the presence of salts

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Abstract

Water plays a key role in human life. The shortage of fresh water is now a big issue in the world. As results, seawater desalination to produce drinking water is becoming indispensable part of the solution. Recently, hydrate-based crystallization processes attract more interests for desalination purposes.

In this research work, Cyclopentane (CP) is used as a hydrate former for desalination process via crystallization at low temperature and atmospheric pressure. The objective of this study is to provide the phase equilibrium data of CP hydrates in the presence of new salts (NaBr, KBr, Na_2SO_4, K_2SO_4) and their mixtures under a wide range of concentrations. The experimental data for CP hydrates in the presence of salts are obtained in a batch reactor system with a temperature range of -8÷1°C and salinity up to 20 wt.%. The effects of salts (NaCl, NaBr, KBr, Na_2SO_4, K_2SO_4) and their mixtures with different concentrations on kinetics of CP hydrate formation are also investigated. Hopefully, the results of this research will be applied to desalination or water treatment.

Keywords: desalination, hydrates, thermodynamics, kinetics.