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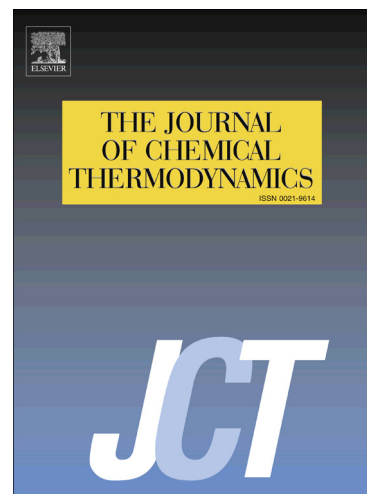
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**Stochastic nature of nucleation and growth kinetics of THF hydrate**

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**Abstract**

Numerous experiments of tetrahydrofuran (THF) hydrate are carried out to investigate the stochastic nature of formation kinetic parameters, i.e., induction time, peak temperature and formation time. The statistics theory and Statistical Product and Service Solutions (SPSS) software are employed to analyze the experimental data. The results show that the stochastic nature of these kinetic parameters does exist and basically fits the lognormal distribution identified by the frequency distribution (histogram), the quantile-quantile (Q-Q) plot, Lilliefors corrected Kolmogorov-Smirnov (K-S) test and Shapiro-Wilk (S-W) test. Relatively speaking, the stochastic nature of growth kinetics (peak temperature and formation time) is weaker than that of nucleation kinetics (induction time). Based on the statistical results, the induction time and formation time are shortened with the increase of supercooling degree and the stochastic nature is also weakened. In the presence of seasand, induction time is reduced; however, the influence of seasand on formation time depends on the test sample. The ions in seawater may shorten the induction time although the impact is weaker than that of seasand. Additionally, the seasand sample does not affect peak temperature while the seawater sample does affect peak temperature.

**Keywords:** Stochastic nature; hydrate nucleation and growth; induction time; formation time; peak temperature; statistics method

**1. Introduction**

Gas hydrate has been proved as an important natural gas resource that attracts great attention in the world. Gas hydrate is formed by gas molecules and water molecules under appropriate temperature-pressure condition. Naturally occurring gas hydrate mostly exists in ocean sediment where seawater, sand, clay, organic debris, etc. coexist. At present, many researches are focused on the

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