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Abstract
Natural gas (NG) is the cleanest burning fossil fuel and its usage can significantly reduce CO2 emissions from power plants. With its widespread use, there is an ever increasing need to develop technologies to store NG on a large scale. NG storage via clathrate hydrates is the best option for a large scale storage system because of its non-explosive nature, mild storage conditions, high volumetric capacity and being an environmentally benign process. In this work, we demonstrate a new method to achieve rapid methane hydrate formation in an unstirred tank reactor configuration (UTR) at moderate temperature and pressure conditions employing tetrahydrofuran (THF) as a promoter. For the first time, THF is reported to act both as a thermodynamic and an excellent kinetic promoter for methane hydrate formation. We demonstrate a multi-scale experimental validation of our method to a volumetric sample scale-up factor of 120 and internal reactor diameter scale-up factor of 10. Further, new insights on the dissociation behavior of the hydrates are reported. There is a competitive edge for storing NG via clathrate hydrates compared to compressed natural gas storage both in terms of cost and safety. (C) 2016 Elsevier B.V. All rights reserved.

Keywords
Author Keywords: Gas hydrates; Energy storage; Tetrahydrofuran; Enhanced kinetics; Natural gas storage; Unstirred tank reactor

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