

A perspective on Rheological Studies of Gas Hydrate Slurry properties

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ABSTRACT

Gas hydrates are solid inclusion compounds that are composed of a three-dimensional hydrogen-bonded network of water cages that can trap small gas molecules, such as methane and carbon dioxide. Understanding the rheological properties of gas hydrate crystals in solution can be critical in a number of energy applications, including the transportation of natural gas in subsea and onshore operations, as well as technological applications for gas separation, desalination, or sequestration. A number of experimental and modeling studies have been done on hydrate slurry rheology; however, the link between theory and experiment is not well-defined. This article provides a review on the current state of the art of hydrate slurry viscosity measurements from high- and low-pressure rheometer studies and high-pressure flowloops over a range of different sub-cooling ($\Delta T_{\text{sub}} = T_{\text{equil}} - T_{\text{exp}}$) and fluid conditions, including for water and oil continuous systems. The theoretical models that have been developed to describe the gas hydrate slurry relative viscosity are also reviewed. Perspectives' linkage between the experiments and theory is also discussed.

KEYWORDS:

Relative viscosity; Flow assurance; Rheometer; Oil-continuous