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## FINAL PH.D. DEFENSE

PETROLEUM ENGINEERING

***Phase Behavior of Single, Binary, and Ternary $CH_4$-$C_2H_6$-$CO_2$ Hydrate Systems***


Abstract

Understanding the phase behavior of gas hydrates is critical to flow assurance, geological stability, energy recovery, and industrial applications such as gas storage and desalination. Systems containing $CH_4$, $C_2H_6$, and $CO_2$ are of interest because they are ubiquitous in nature and many industrial activities, and also due to their microscopic properties, e.g., the structure change of the $CH_4$-$C_2H_6$ hydrates and the impact of $CO_2$. In this thesis, the phase behavior of $CH_4$-$C_2H_6$-$CO_2$ hydrates is explored using experiments, thermodynamic models, and molecular dynamic (MD) simulation. Specifically, a high-pressure PVT experimental apparatus is designed to measure the hydrate phase boundary and to observe the growth behaviors of the hydrate film. Three theoretical models with different frameworks are developed to calculate the hydrate phase boundary. The reliability of these models is verified by comparing with a database established in this work. The stability of $CH_4$-$C_2H_6$ and $CH_4$-$C_2H_6$-$CO_2$ hydrates and the impact of pressure are clarified using MD simulation.


**Date:**

**Tuesday, Dec 8th, 2020**

**Time:**

**Starts @ 1:00PM**

**Zoom Meeting Details:**

HYPERLINK

Meeting ID: 980 6124 5575

Password: 953674

**Committee Chair:**

**Assistant Professor Xiaoli (Laura) Li**