Hydrogen sulfide is being produced in higher concentrations as the price of natural gas rises and sour gas fields are becoming more economical to produce. The presence of hydrogen sulfide in natural gas can increase the hydrate formation temperature by up to 12 K at real gas field concentrations. With such an increase in the hydrate formation temperature, it is critical to be able to predict hydrate phase equilibria for producing gas fields. Phase equilibria programs like CSMGem can predict phase equilibria for most systems with approximately 1 K accuracy. In order for CSMGem to predict phase equilibria accurately, Kihara potential parameters must be regressed from experimental data. A literature review was performed to identify and categorize all published H₂S hydrate phase equilibria measurements. Only 353 data points could be found, with just one study on inhibited sII H₂S containing hydrates. This represents a paucity of data for H₂S hydrates and requires programs like CSMGem to extrapolate predictions in applied gas field scenarios.

Keywords: CSMGem, Hydrogen Sulfide, Sour Gas, Phase Equilibrium

INTRODUCTION
Clathrate hydrates are crystalline solids that form in natural gas and oil transmission lines. The hydrate crystal is formed when water molecules arrange themselves to form hydrogen-bonded polyhedral cages (host), which can trap (guest) molecules that are commonly found in natural gas. The guest molecules vary in size and structure and help support the hydrogen-bonded host network by repulsive electronic interactions. The two most common hydrate structures are structure I, which consists of two 5₁² cages and six 5₁²6₂ cages per unit cell, and structure II, which consists of sixteen 5₁² cages and eight 5₁²6₄ cages per unit cell [1]. How a guest molecule fits into, and subsequently stabilizes, each of these three types of cages will determine how stable the hydrate structure is at any given temperature and pressure. Therefore, cage stability determines phase stability and defines the phase equilibria of the hydrate phase. As such, there are some molecules which are poor hydrate formers, such as pure hydrogen which is too small to stabilize even the 5₁² cage at low pressures, and there are exceptional hydrate formers, such as cyclopentane which can form hydrates at ambient pressure and above the ice point.