A Simpler Approach for Gas Hydrate Phase Equilibria in Inhibited Systems

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Gas hydrates phase equilibria predictions for inhibited systems with salts and organic inhibitors are critical in a number of applications, with particular importance in the oil and gas as the prevention of hydrates is paramount for safe and continuous production. While there exists numerous methods and model for hydrate phase equilibria and inhibited systems, they all rely on fitting of specific data that rely on experimental measurements and are system specific by adjusting the water activity contribution to the chemical potential of water. We have shown that recently that a better approach is to treat gas hydrate inhibition as a colligative property, which causes the formation temperature, at a given pressure, of hydrates to be depressed with the presence of inhibitors (salts and organics), which remain in solution and are not part of the hydrate structure. This is directly analogous to the freezing point depression of water. This simple approach is fundamentally sound and accurate in capture all the available measured data in the literature, which demonstrates that reliable predictions can be made by simply knowing the change in the water activity in the presence of the inhibitors. The correlations developed for the water activity are universal and can be used for any range of concentration and combination of inhibitors.