

Inhibition effects of urea and hydrogen bond donors (HBDs) and their synergetic effects on CH₄ hydrate formation

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Ionic liquids (ILs) are well-known materials for inhibiting hydrate formations. However, due to their toxicity, and a high cost, it is not suitable to inject directly into the pipelines. Luckily, deep eutectic solvent (DES) and low transition temperature mixture (LTTM) were found that they can work like ILs, because of hydrogen bonding (HB) interactions between molecules. Furthermore, molecules making DES and LTTM are bio-degradable and cost-effective candidates, expecting that those are not only the fine gas hydrate inhibitors but also the green materials to the pipelines. We conducted temperature ramping experiments in the autoclave by adding urea and various HB donors, or mixing them together to evaluate their kinetic hydrate inhibitor (KHI) performances. Additionally, we did molecule screening via COSMOS - RS and derived σ -profile, σ -potential, and HB energy to suggest the sketchy way explaining how the molecular structures have an influence on inhibitor performances. We expect that the results of this work can contribute to avoiding pipeline blockage due to gas hydrate formation in gas and oil production by developing low-cost and environmentally benign inhibitors.