

Avoiding Gas Hydrate Problems in Qatar Oil and Gas Industry: Environmentally Friendly Solvents for Gas Hydrate Inhibition

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Abstract : Qatar's one of the biggest problem in processing its natural resource, which is natural gas, is the often occurring blockage in the pipelines caused due to uncontrolled gas hydrate formation in the pipelines. Several millions of dollars are being spent at the process site to dehydrate the blockage safely by using chemical inhibitors. We aim to establish national database, which addresses the physical conditions that promotes Qatari natural gas to form gas hydrates in the pipelines. Moreover, we aim to design and test novel hydrate inhibitors that are suitable for Qatari natural gas and its processing facilities. From these perspectives we are aiming to provide more effective and sustainable reservoir utilization and processing of Qatari natural gas. In this work, we present the initial findings of a QNRF funded project, which deals with the natural gas hydrate formation characteristics of Qatari type gas in both experimental (PVTx) and computational (molecular simulations) methods. We present the data from the two fully automated apparatus: a gas hydrate autoclave and a rocking cell. Hydrate equilibrium curves including growth/dissociation conditions for multi-component systems for several gas mixtures that represent Qatari type natural gas with and without the presence of well known kinetic and thermodynamic hydrate inhibitors. Ionic liquids were designed and used for testing their inhibition performance and their DFT and molecular modeling simulation results were also obtained and compared with the experimental results. Results showed significant performance of ionic liquids with up to 0.5 % in volume with up to 2 to 4 °C inhibition at high pressures.

Keywords : gas hydrates, natural gas, ionic liquids, inhibition, thermodynamic inhibitors, kinetic inhibitors

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