

Environmentally Friendly Gas Storage with Hydrate Technology

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Abstract: Hydrates offer a promising solution for natural gas storage and transportation, and carbon dioxide capture and storage, although their slow formation rate and high energy requirements have impeded commercialization efforts. To address these challenges, researchers have explored the use of promoters such as tetrahydrofuran (THF) and sodium dodecyl sulfate (SDS). While THF accelerates hydrate formation, SDS can lead to undesired foam formation.

This study investigates the efficacy of three amino acids—valine, methionine, and leucine—as promoters for methane hydrate formation. Our findings demonstrate that all three amino acids exhibit varying degrees of promotion, with some surpassing the performance of SDS. Optimal concentration levels of amino acids emerge as a critical factor for effective promotion. Importantly, the utilization of amino acids as promoters presents an eco-friendly approach devoid of foam formation, making them an appealing alternative to SDS.

Furthermore, this research sheds light on the morphology of the resulting hydrates, providing valuable insights for the advancement of hydrate formation systems. In conclusion, our results strongly indicate that amino acids hold significant potential as highly effective promoters for hydrate formation, potentially paving the way for the commercialization of this environmentally sustainable gas storage technology.