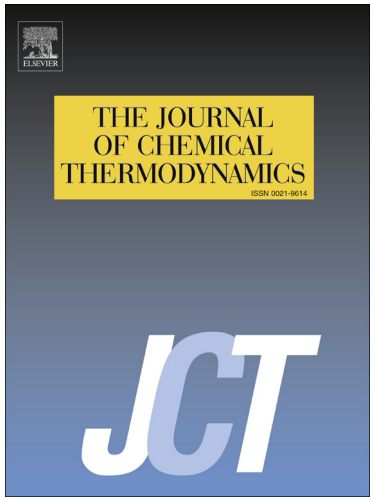

Experimental study and thermodynamic modeling of the stability conditions of methane clathrate hydrate in the presence of TEACl and/or BMIM-BF_4 in aqueous solution

Fatemeh Kazemi, Jafar Javanmardi, Sara Aftab, Amir H. Mohammadi

PII: S0021-9614(18)30671-2
DOI: https://doi.org/10.1016/j.jct.2018.09.014
Reference: YJCHT 5543

To appear in: *J. Chem. Thermodynamics*

Received Date: 22 June 2018
Revised Date: 15 September 2018
Accepted Date: 17 September 2018

Please cite this article as: F. Kazemi, J. Javanmardi, S. Aftab, A.H. Mohammadi, Experimental study and thermodynamic modeling of the stability conditions of methane clathrate hydrate in the presence of TEACl and/or BMIM-BF_4 in aqueous solution, *J. Chem. Thermodynamics* (2018), doi: https://doi.org/10.1016/j.jct.2018.09.014

Experimental study and thermodynamic modeling of the stability conditions of methane clathrate hydrate in the presence of TEACl and/or BMIM-BF_4 in aqueous solution

Fatemeh Kazemi [a], Jafar Javanmardi [a, *], Sara Aftab [b], Amir H. Mohammadi[c,d*]

[a] *Department of Chemical Engineering, Shiraz University of Technology, Shiraz, Iran*

[b] *Department of Chemical Engineering, School of Chemical and Petroleum Engineering, Shiraz University, Shiraz, Iran*

[c] *Institut de Recherche en Génie Chimique et Pétrolier (IRGCP), Paris, Cedex, France*

[d] *Discipline of Chemical Engineering, School of Engineering, University of KwaZulu-Natal, Howard College Campus, King George V Avenue, Durban 4041, South Africa*

Abstract - In this work, 1-butyl-3-methylimidazolium tetrafluoroborate (BMIM-BF_4) and Tetra ethyl-ammonium chloride (TEACl) were experimentally investigated to study their effects on thermodynamic stability conditions of methane clathrate hydrate. BMIM-BF_4 and TEACl different aqueous solutions (4.77 wt% (0.57 mole%) TEACl + 4.85 wt% (0.43 mole%) BMIM-BF_4, 9.15 wt% (0.20 mole%) TEACl + 9.38 wt% (0.90 mole%) BMIM-BF_4 and 11.82 wt% (1.63 mole%) of TEACl + 11.82 wt% of BMIM-BF_4 (1.20 mole%) in aqueous solution) were used as thermodynamic inhibitors which have not been reported in literature. The experiments were conducted at constant volume from 274.6 K to 283.2 K and 3.18 MPa to 7.93 MPa. Moreover, the methane hydrate phase equilibria in the aforementioned ILs aqueous solutions were modeled. For this purpose, the chemical potential of hydrate is calculated using the van der Waals–Platteeuw (vdWP) theory. Also, the Peng-Robinson (PR) equation of state (EoS) is used for calculation of the gas phase fugacity. Water activity in the aqueous phase is determined by the NRTL activity coefficient model. Comparing the experimental data with the modeling results confirms the model compatibility. It can also be observed that mixtures of the two

*Corresponding authors: E-mail: javanmardi@sutech.ac.ir and amir_h_mohammadi@yahoo.com