

Supporting Information

Effect of Thiouronium-based Ionic Liquids on the Formation and Growth of CO₂ (sI) and THF (sII) Hydrates

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Figure S1. Comparison of CO₂ hydrates phase equilibria in presence of ~10 wt% ILs reported in the literature [1-5] along with the two thiouronium ionic liquids tested in this work. The dotted line represents the CO₂ hydrates phase equilibria in absence of any additive.

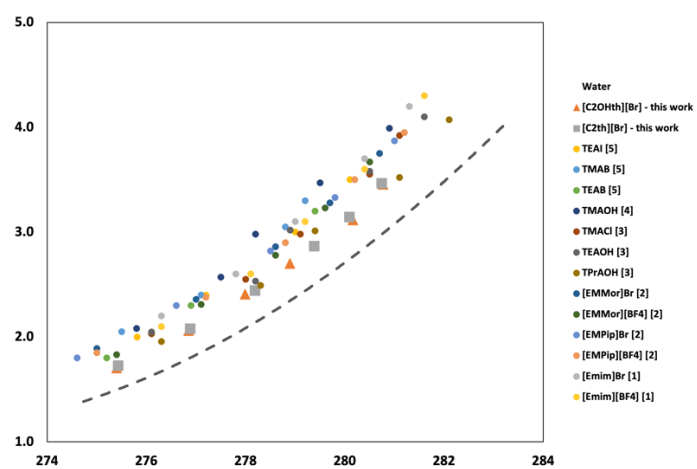


Figure S2. Onset nucleation temperatures (T_{on}) of CO₂ hydrates in Milli-Q water and in 1 wt% aqueous solution of thiuronium ionic liquids at 30 bar and 36 bar obtained from 12 different experiments (represented at x-axis). The blue dashed lines represent the average T_{on} values for the system and are reported in Table 2. The error bars represent the standard deviation values of the measurements for respective set of experiment.

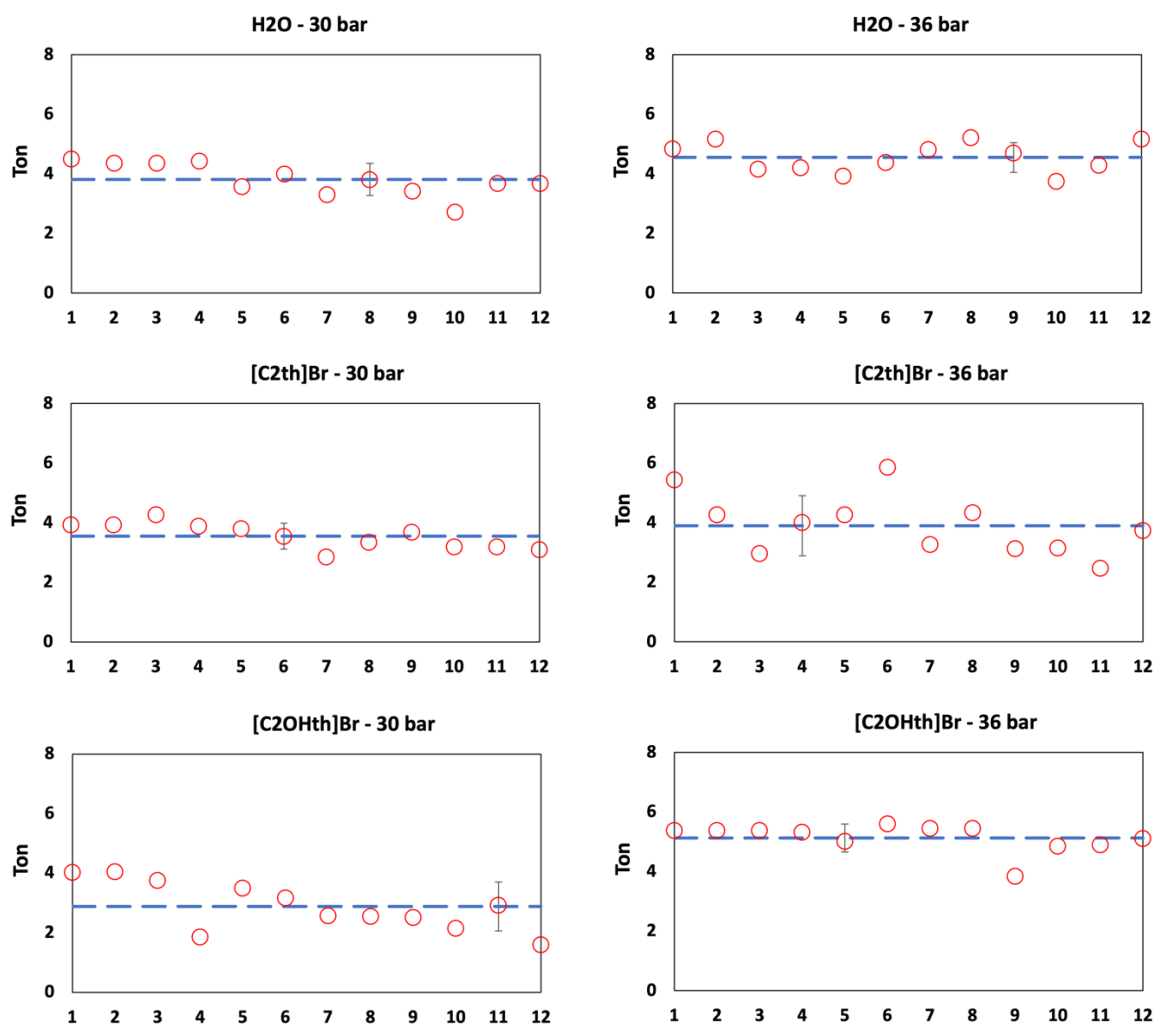


Table S1. Results of the twin-tailed t-test of the onset temperature of nucleation (T_{on}) and decomposition temperatures (T_{od}) values for the studied (H_2O+CO_2) and (H_2O+CO_2+IL) systems obtained at different pressures.

Pressure (P/bar)	Milli Q water – [C ₂ th][Br]	Milli Q water – [C ₂ OHth][Br]
T_{on} Values		
30	t-value: 1.29871 P-value: 0.207493 Remarks: result not significant at P<.05	t-value: 3.26739 P-value: 0.003524 Remarks: result significant at P<.05
36	t-value: 1.98456 P-value: 0.059804 Remarks: result not significant at P<.05	t-value: -2.94431 P-value: 0.007501 Remarks: result significant at P<.05
T_{od} Values		
30	t-value: 5.01324 P-value: 0.000051 Remarks: result significant at P<.05	t-value: 8.20428 P-value: <0.00001 Remarks: result significant at P<.05
36	t-value: 2.2334 P-value: 0.036013 Remarks: result significant at P<.05	t-value: 2.81639 P-value: 0.010054 Remarks: result significant at P<.05

References:

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- [3] Khan, M. S.; Bavoh, C. B.; Partoon, B.; Lal, B.; Bustam, M. A.; Shariff, A. M. Thermodynamic Effect of Ammonium Based Ionic Liquids on CO₂ Hydrates Phase Boundary. *J. Mol. Liq.* 2017, 238, 533.
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