Uncertainty Analysis for the Parameterization of Glycrons

A review of the 4C association scheme for mono-ethylene glycol (MEG)

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Background

• Collaboration between DTU-CERE and Statoil ASA
• Natural gas dehydration: Statoll Subsea Factory TM and Gas-2-Pipe TM
• Important Sales Gas specifications:
  - Hydrocarbon dew point: cricondenbar 105-110 bar
  - H2O dew point: 32 ppm
  - Glycol in the gas phase 8 l/m3
• Phase equilibria measurements and thermodynamic modelling of petroleum fluids relevant to subsea processing

Results and Discussion

Use of pure component experimental data versus pseudo data

• Accuracy of MEG liquid density prediction sacrificed by incorporating the LLE criterion
• MEG vapour pressure data exhibits significantly higher variance than the DIPPR correlation suggests
• Bootstrapped parameter plots show high degree of correlation when fitting to DIPPR

Uncertainty analysis: new CPA-4C MEG parameters

• Literature parameters do not match well with bootstrapped mean parameter estimator
• Mean of the average absolute error and 95% confidence interval over 1500 optimization runs:

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Application for Simplified NG Dehydration Systems

• Improved correlation of the MEG entrained into CH4-rich phase
• Prediction is best at both high temperature and high pressure
• Low temperature anomalies may be due to experimental difficulties

Conclusions

• Excess (unnoticed) parameter correlation avoided by using raw experimental data in optimization routines
• New MEG 4C parameters provide improved description for simplified natural gas dehydration applications
• Accurate prediction of all components in all phases remains challenging
• Discrepancies highlight need for further experimental data and model development

Future Work

• Generation of new experimental data for additional model evaluation
• Apply uncertainty analysis to newly proposed association schemes
• Inclusion of tri-ethylene glycol (TEG) data and modelling
• Modelling of natural gas dehydration in Aspen

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