Fluid Characterization of a Gas Condensate

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Society of Petroleum Engineers

What is Fluid Characterization?

- Describe Phase Behavior
- Basic Input for Other Calculations
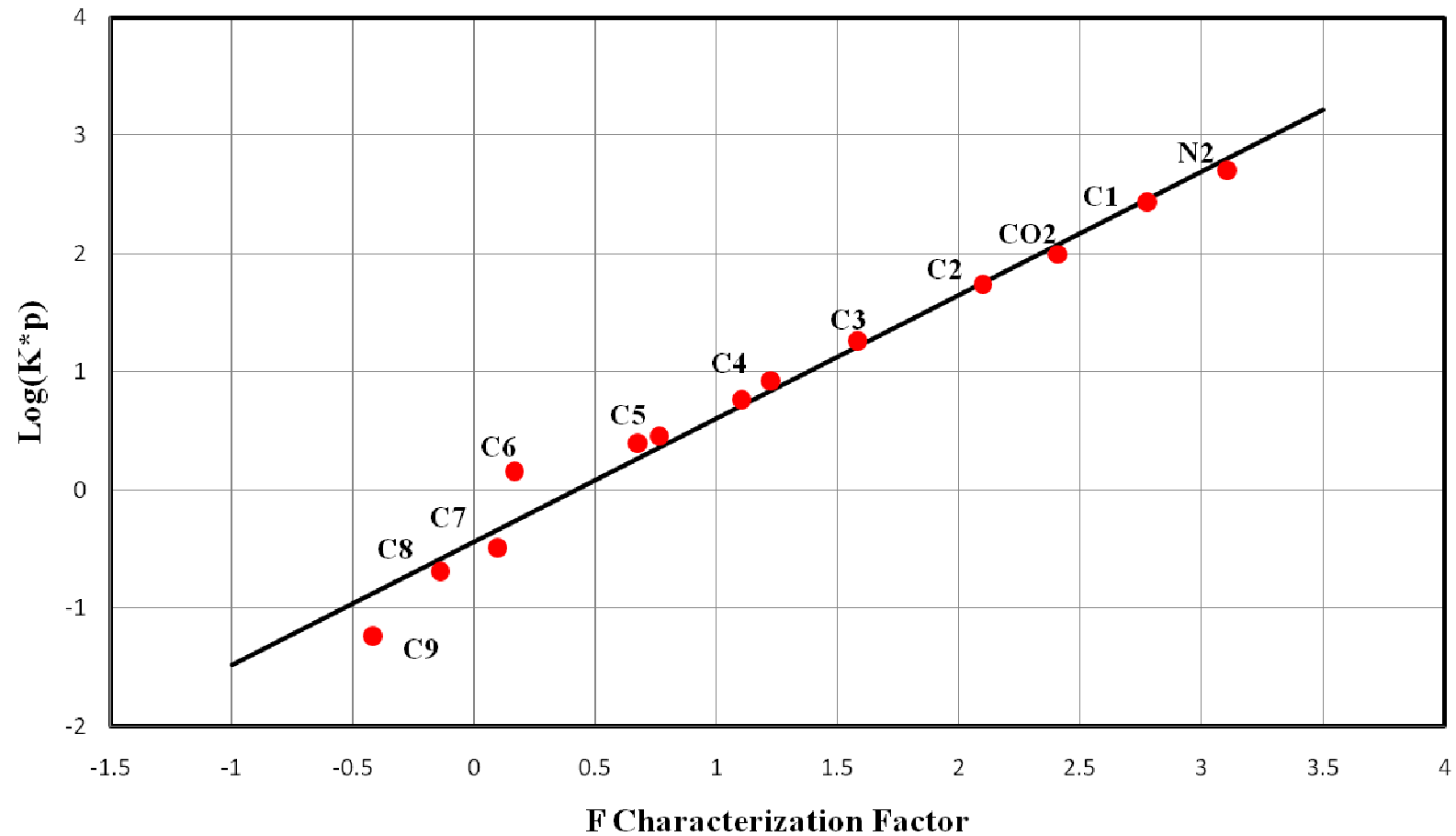- Accuracy is crucial
- EOS vs. Black Oil

Example

- Gas condensate
- Liquid dropout is over 45%
- C7+ fraction is really high (13.27%)
- TBP, CCE and CVD measurements were performed on the sample
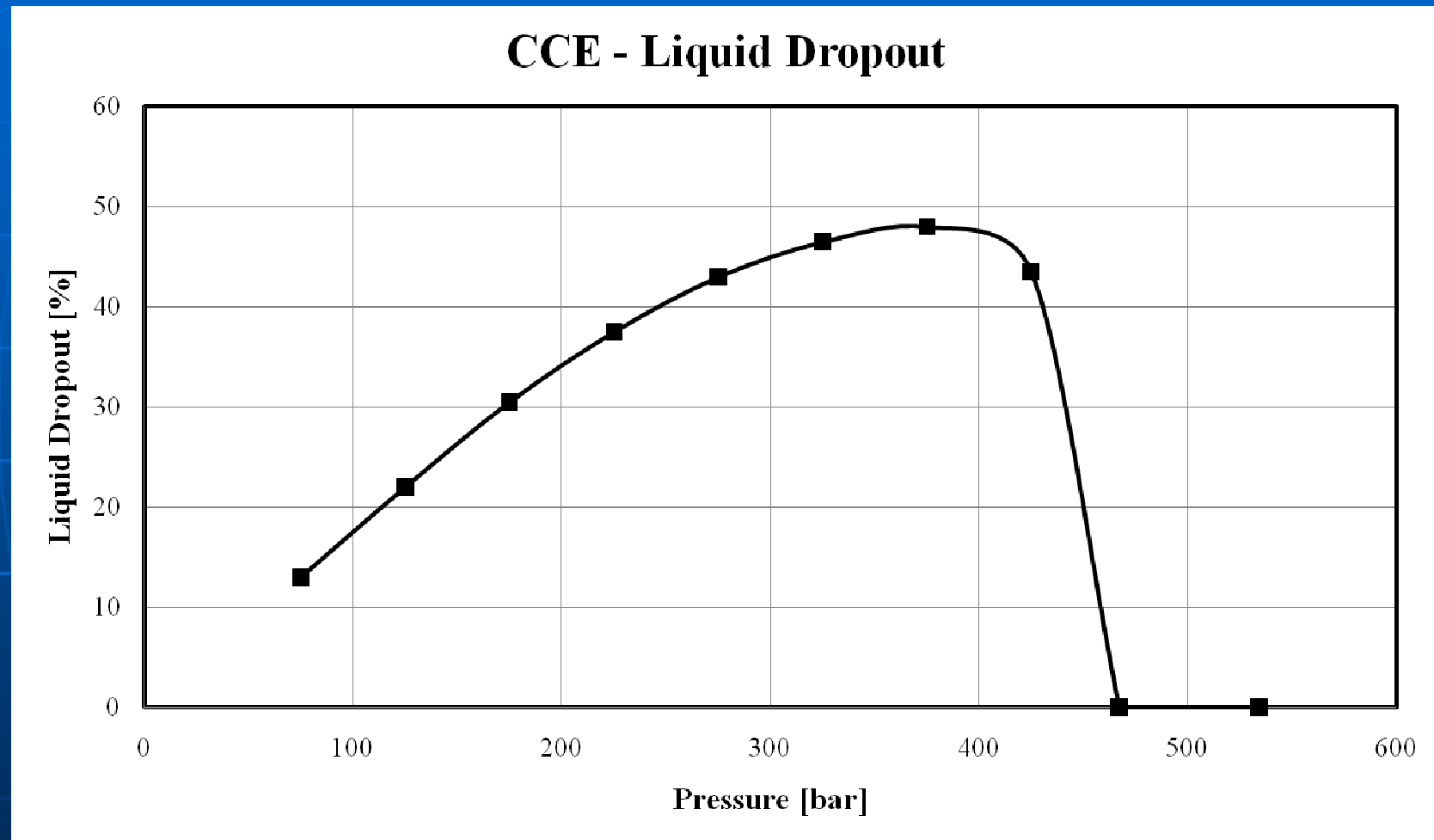
Order of Characterization

- Check PVT measurements
- Characterization of the C7+ frac.
- Regression to measurements
- Check thermodinamical consistency
- Reduction of Components
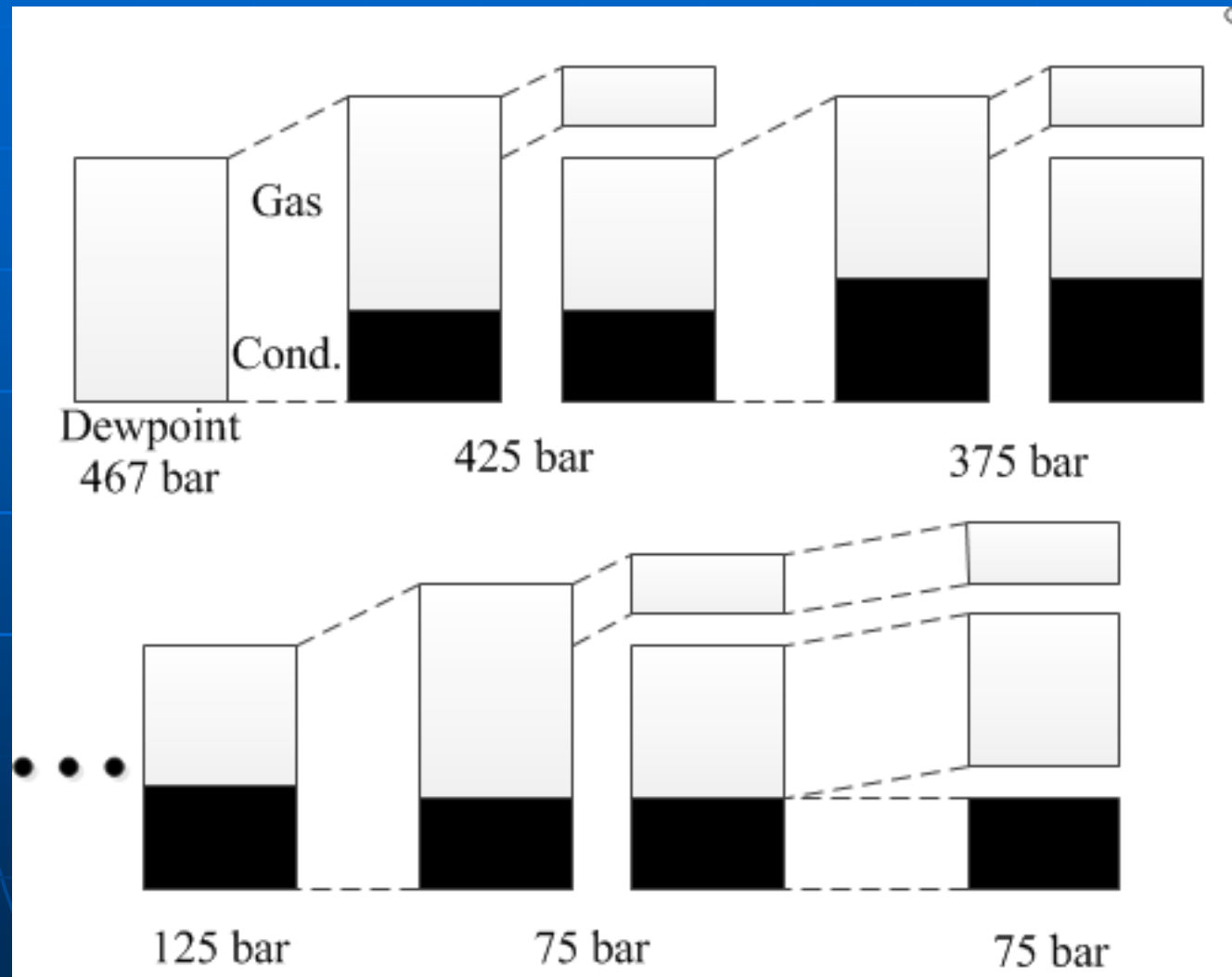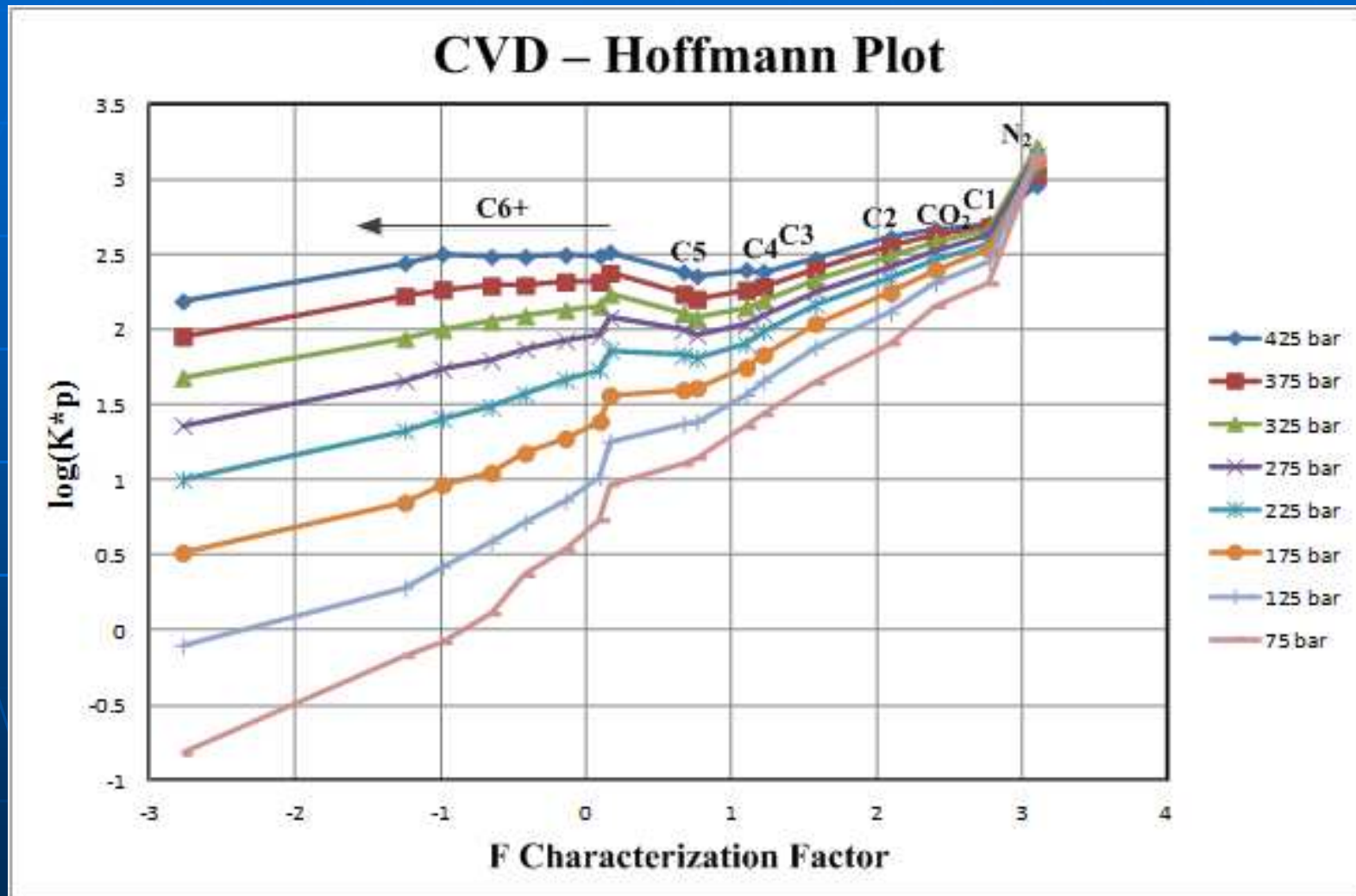
Check of Separator Sample

Hoffman Plot

Constant Composition Expansion

Procedure of CVD experiment
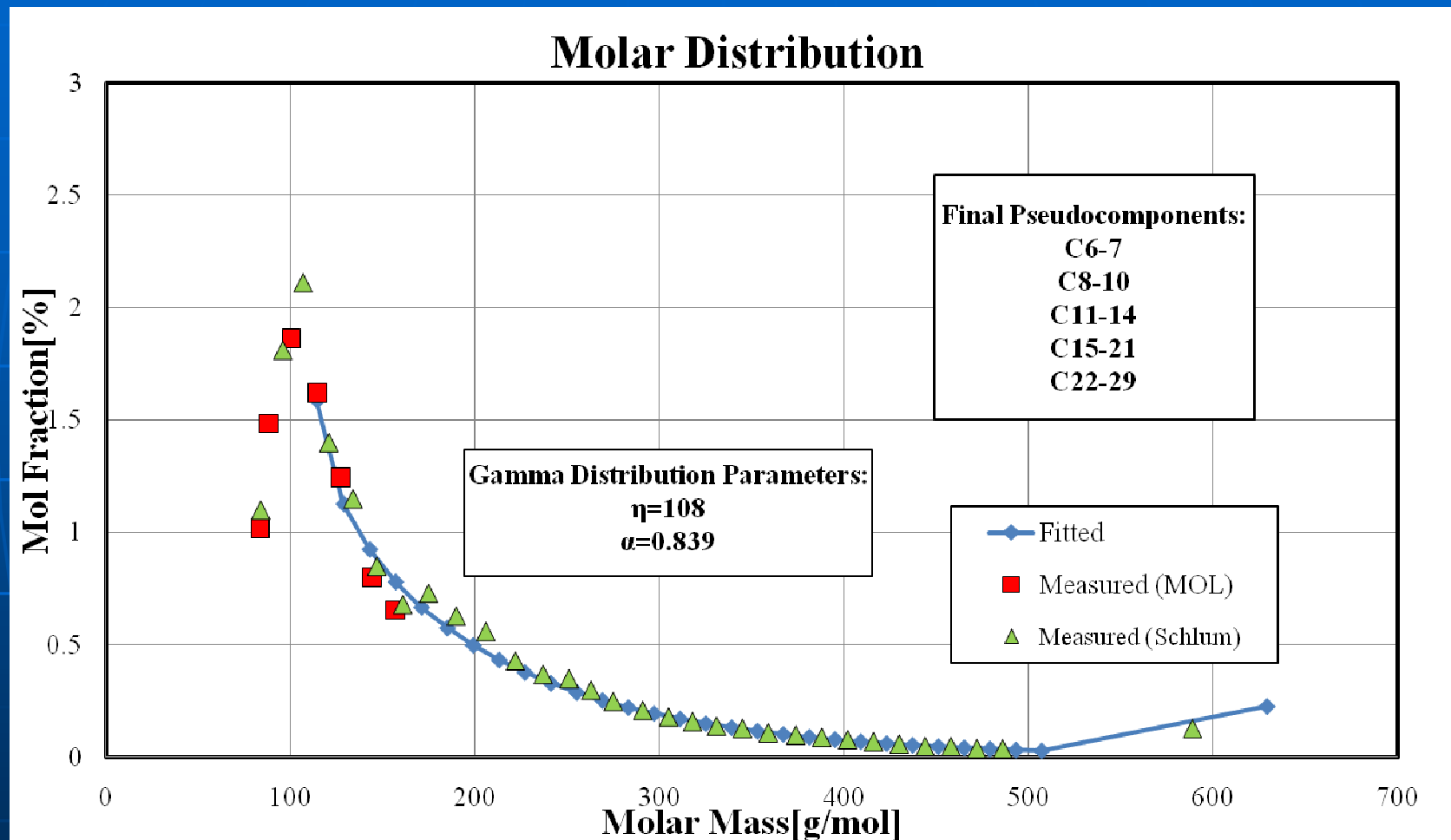
Check of CVD Experiment

C7+ Characterization
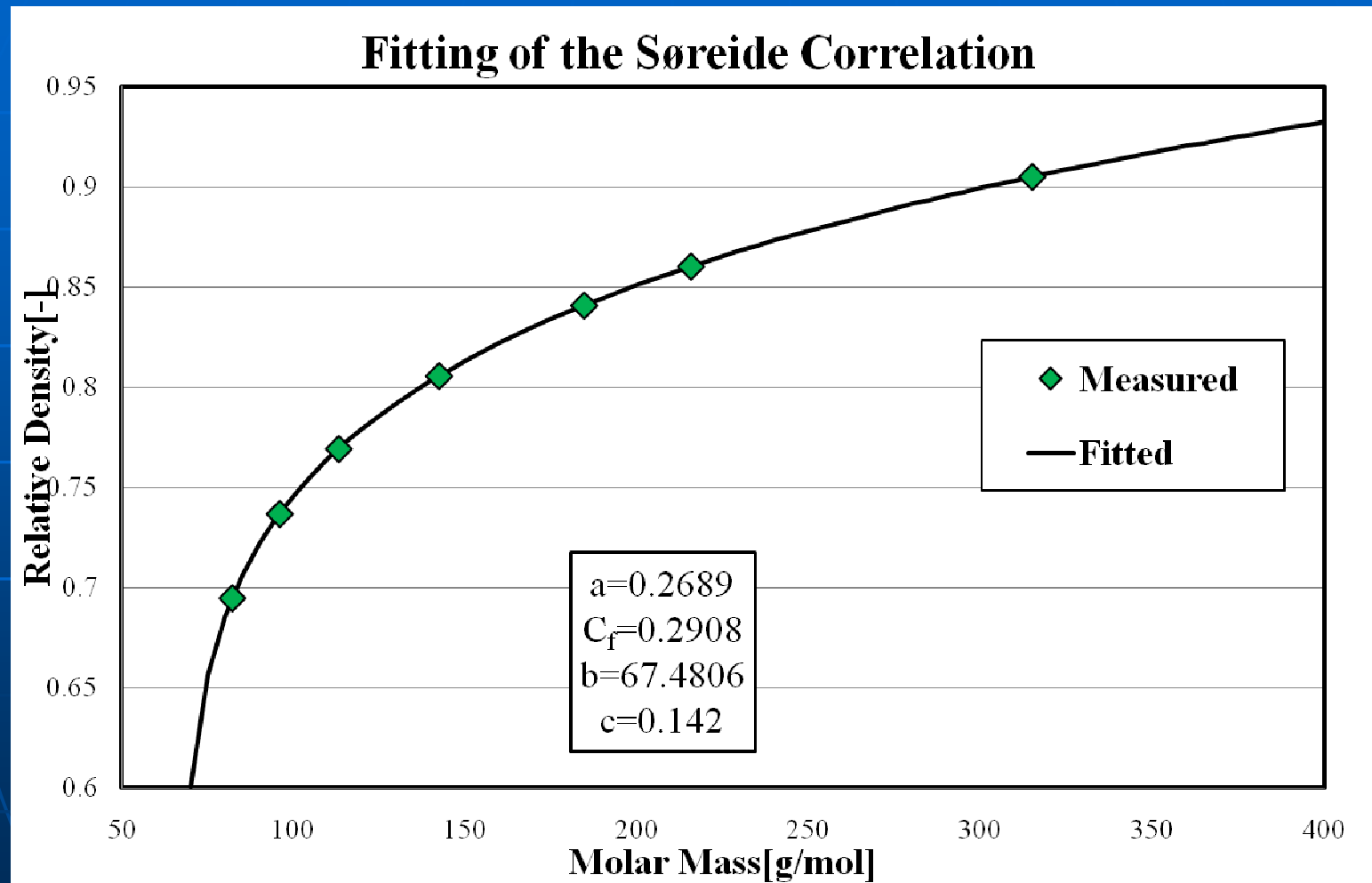
- It is an approximation

3 Main Task:
- Dividing the C7+ fraction
- Defining M, γ and TB
- Estimating the critical properties

Dividing the C7+ Fraction

Determination of Densities

Fitting of the Søreide Correlation

a=0.2689
C_f=0.2908
b=67.4806
c=0.142

Measured
Fitted

Relative Density[-]
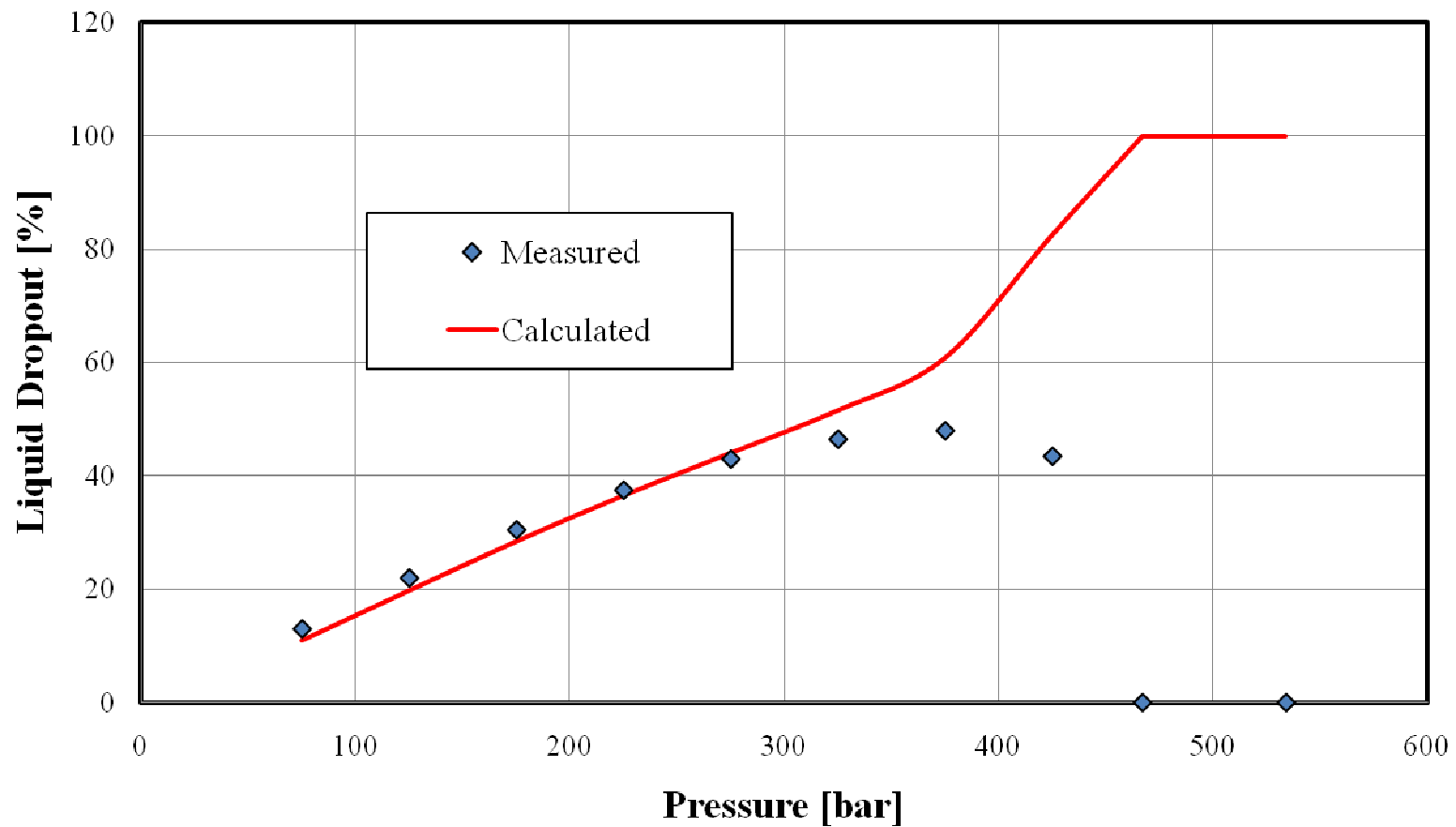Molar Mass[g/mol]

Estimination of Critical and Other Props.

- Soreide for Boiling Point Temp.

- Twu Corr. For Critical Properties
- Kesler-Lee for Acentric Factors
- Chueh-Prausnitz for BIPs
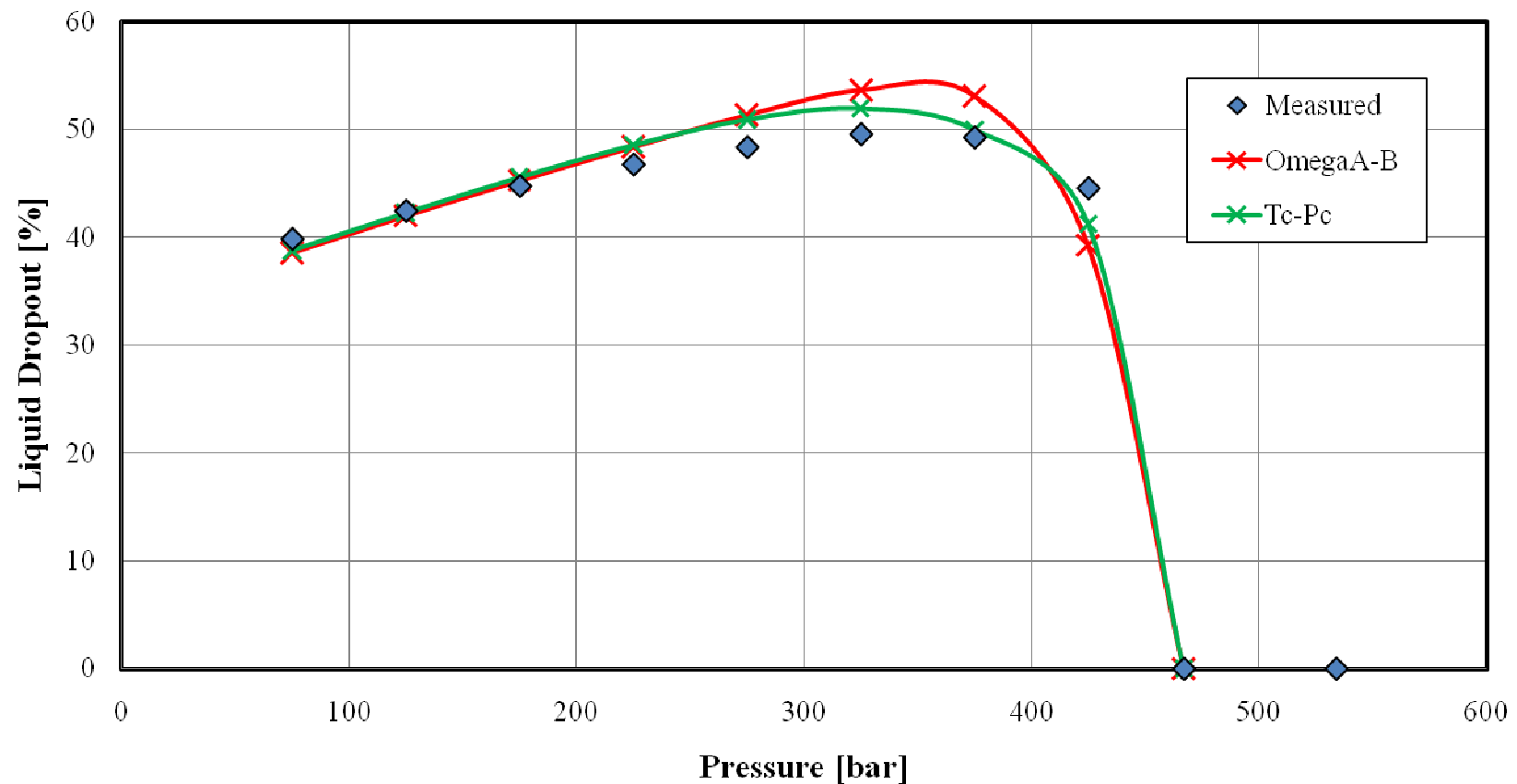
Simulation of Measurements

CCE - Liquid Dropout

Regression

- By Numerical Constants Ω_A & Ω_B (Coats & Smart)
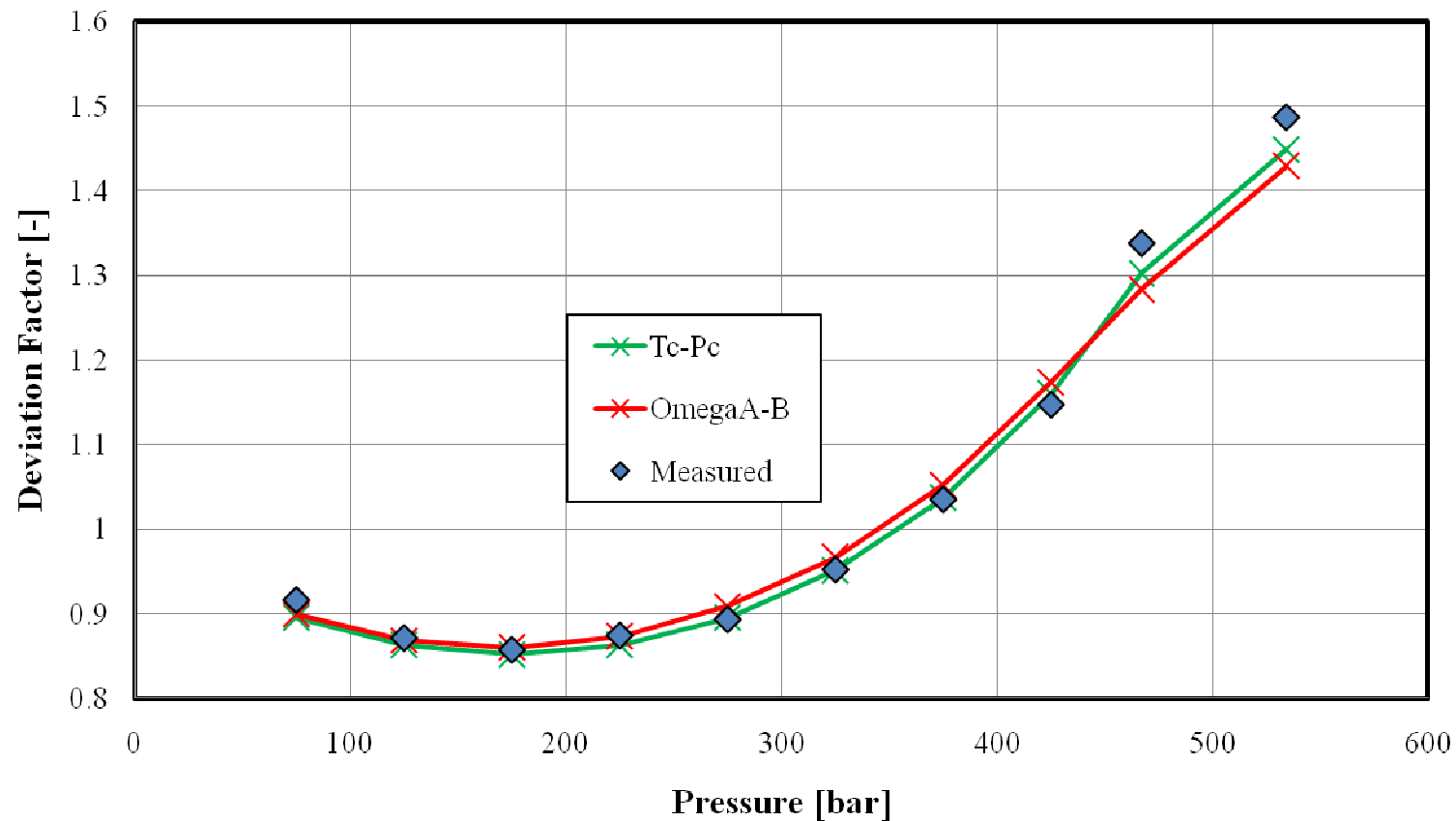- By Critical Properties
- By M, γ, T_B

After Regression
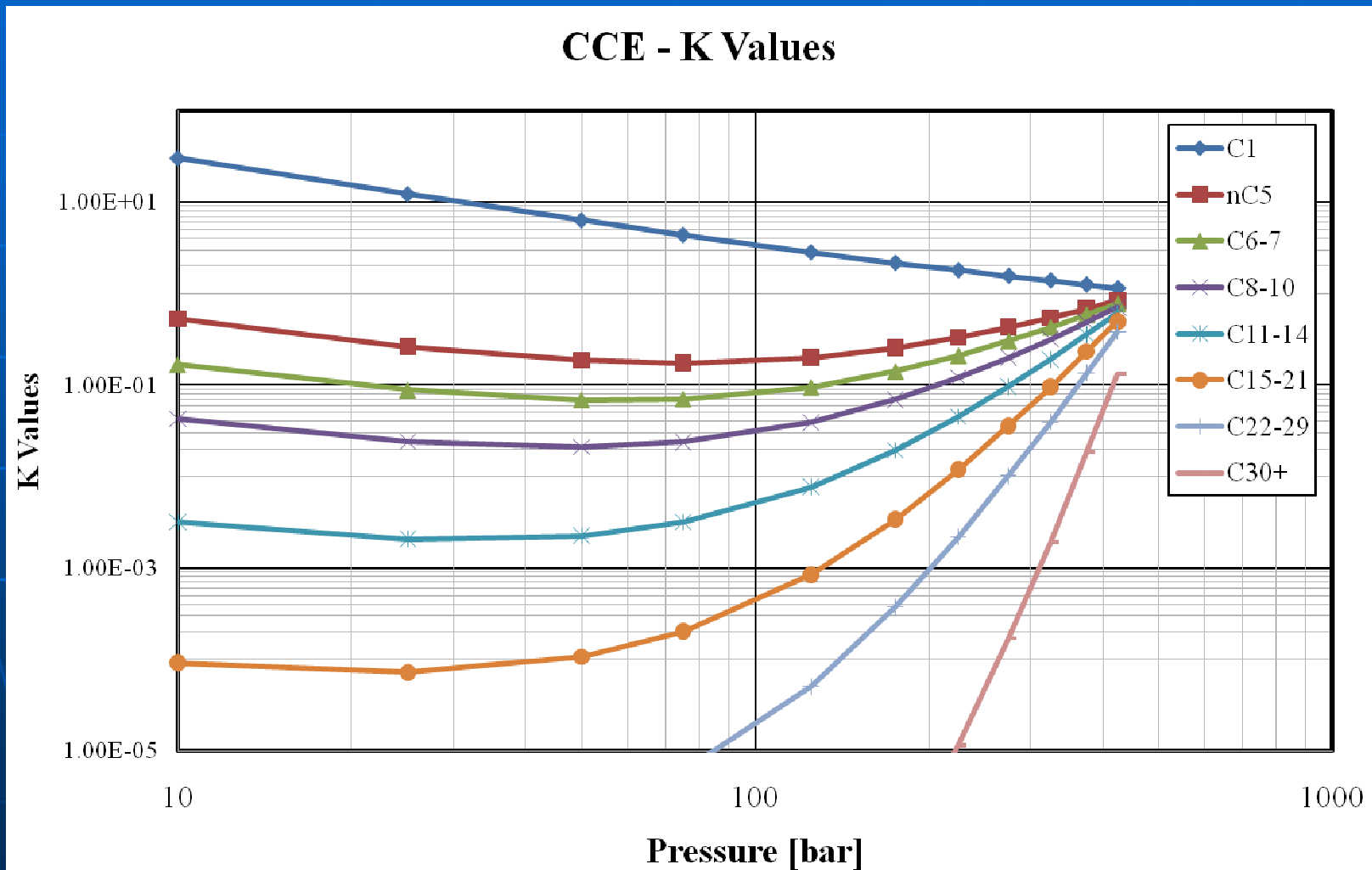
After Regression

CVD - Deviation Factor (gas)

After Regression

Check of Results – Ω_A, Ω_B
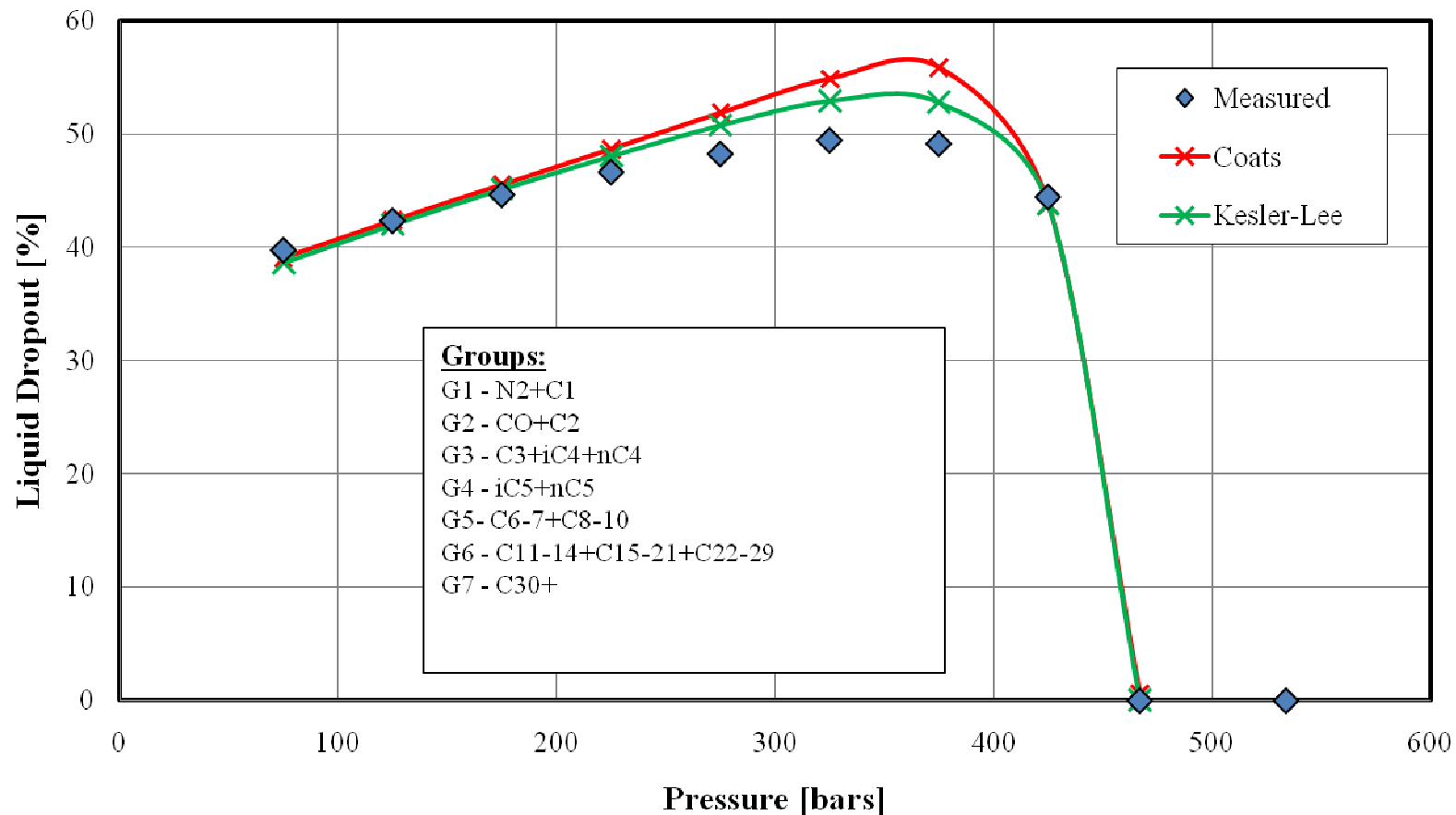

CCE - K Values

Check of Results –Tc, Pc

Grouping of the Components

- Save calculation time and memory
- Number of components
- Mixing rule
- Sometimes step by step grouping and regression

After Grouping

CVD - Liquid Dropout

Groups:
G1 - N2+C1
G2 - CO+C2
G3 - C3+iC4+nC4
G4 - iC5+nC5
G5 - C6-7+C8-10
G6 - C11-14+C15-21+C22-29
G7 - C30+

Legend: Measured, Coats, Kesler-Lee

X-axis: Pressure [bars]
Y-axis: Liquid Dropout [%]

Summary

- Always check the measurements
- Proper C7+ characterization is crucial
- Sufficient regression „tactic" is also crucial
- Always check the results
- Group carefully

Thank You for Your Attention!