



Effect of Impurities on Thermophysical Properties of CCUS Fluids

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CENTRE
FOR GAS
HYDRATE
RESEARCH

Who We Are?

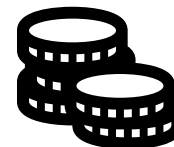
- Based in Edinburgh, UK (Since 1978)
- 6 research staffs, 2 electrical and mechanical technicians.
- Three laboratories with wide range of experimental facilities
range of T & P: (-200 to 250) °C and P < 3000 bar
- Research Interest
Gas Hydrates, Flow Assurance, Fluid Phase Equilibria, and Thermophysical Properties of Fluids.
- In-house thermodynamic software (HWPVT)
- Mainly for Oil & Gas, CCUS, Industrial fluids
- Projects supported by industry



Thermophysical Properties in CCUS

- Phase behaviour
- Density
- Speed of Sound
- Viscosity
- Thermal Conductivity
- Water content
- Heat capacity
- Freeze-out temperature
- ...

- Flow measurement
- Estimation of storage capacity
- Design and optimisation of
 - transport systems
 - process facilities
- Process Safety
- ...



Impact and Methods

- Impact
 - How the presence of impurities will affect thermophysical properties of the CCUS fluid?
 - Gaps in the literature data for CO₂ rich mixtures
 - Deficiencies of predictive models
- Methods
 - Experimental measurements
 - Modelling studies:
 - Developed New predictive model (HWGERG) for CCUS applications.
 - Updated model parameters for various EoSs.
 - Implemented new parameters in the HWPVT software.

Example of Results

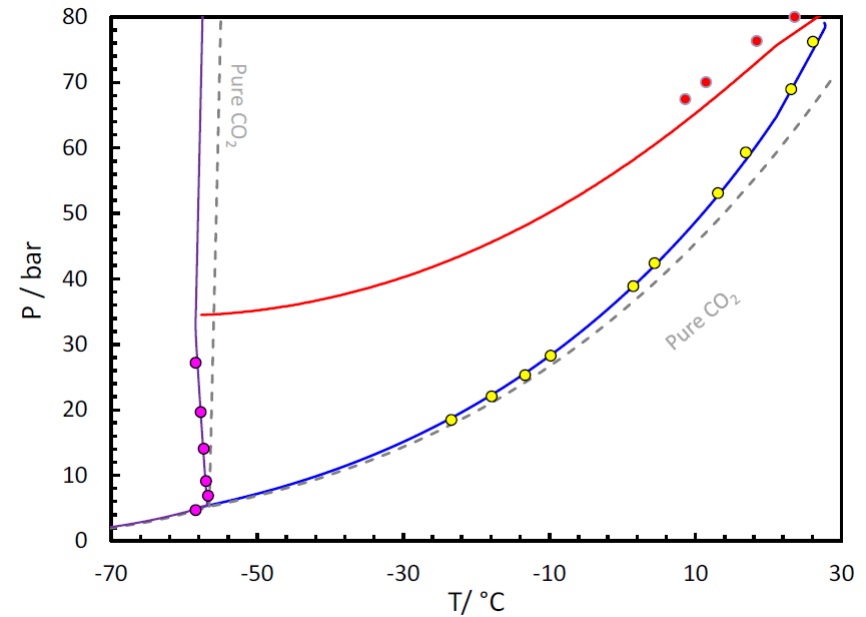
Phase boundaries

CO₂ mixture (95%)



lines: PR EoS

points: experimental data



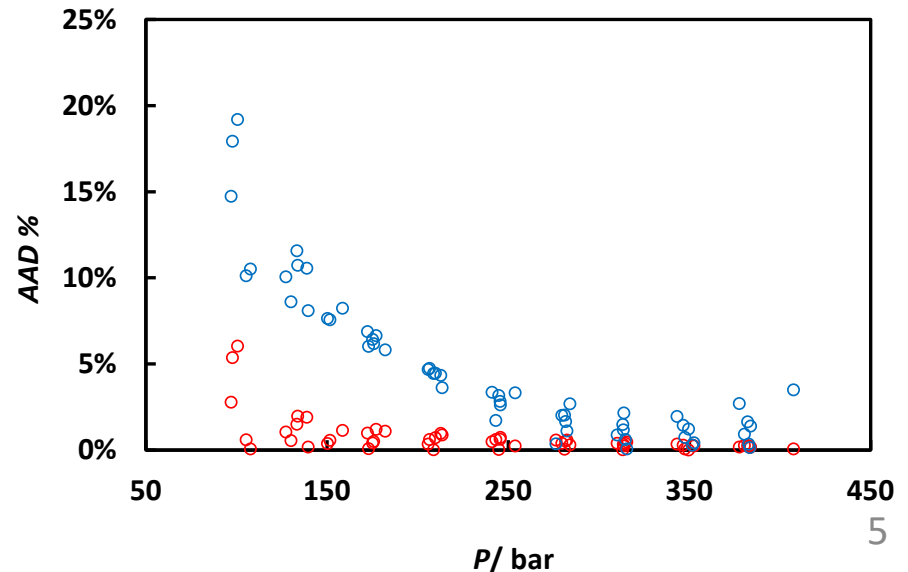
Speed of sound

CO₂ (95%) + H₂ at -15 < T / °C < 30

○ PR EoS

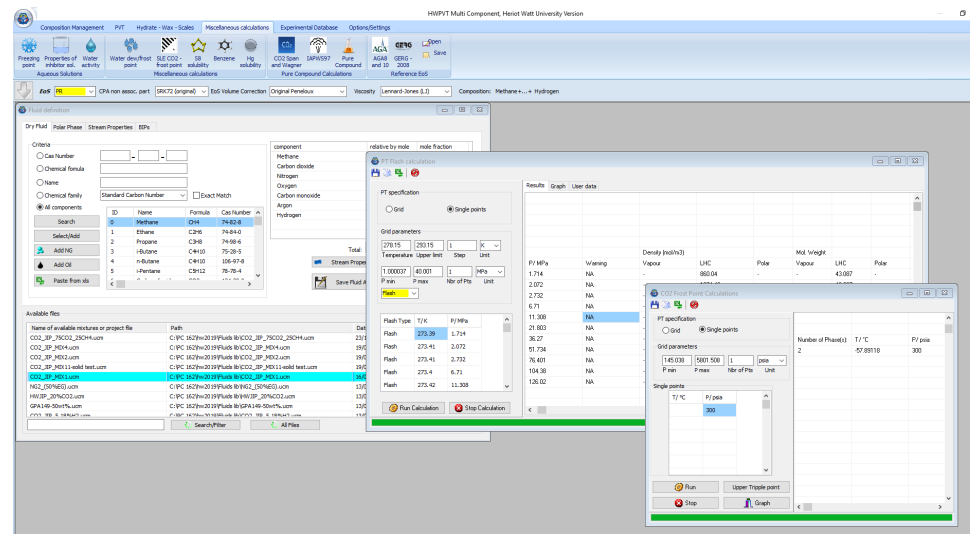


○ HWGERG



Software Package

- HWPVT package
 - Thermodynamic calculations (PVT, Hydrate, Wax,...)
 - Implemented various EoSs (adjusted for CCUS components such as NO_x, SO₂, etc.), Including new predictive model HWGERG.
 - Predict dehydration requirement for CO₂ fluids
 - Experimental database





Thank you for your attention.

For more information contact us

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