Imperial College London

PENDENT DROPS AT ELEVATED *p* & *T*

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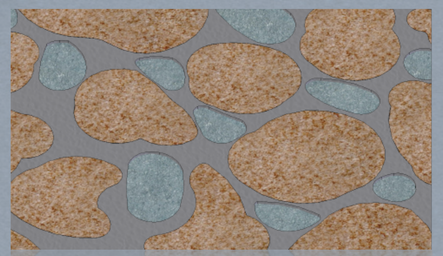
Grand Challenge

Enable clean production of fossil fuels through efficient recovery and processing of hydrocarbons with minimal overall carbon emissions.



1. CO_2 as an EOR process fluid.
2. CO_2 sequestration in depleted reservoirs.

Interfacial phenomena under reservoir conditions are crucial for such processes.

Figure 1: Schematic showing trapped oil phase in rock porous medium.

Objective

Measurements of partially miscible phases containing CO_2 at elevated pressures and temperatures.

1. Interfacial Tensions, γ
2. Contact Angles, θ

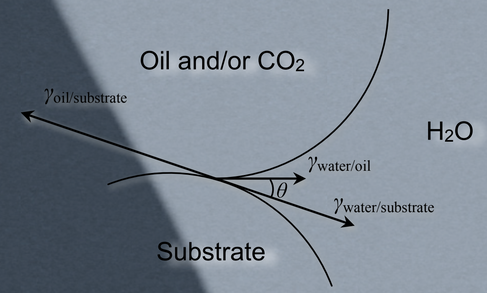
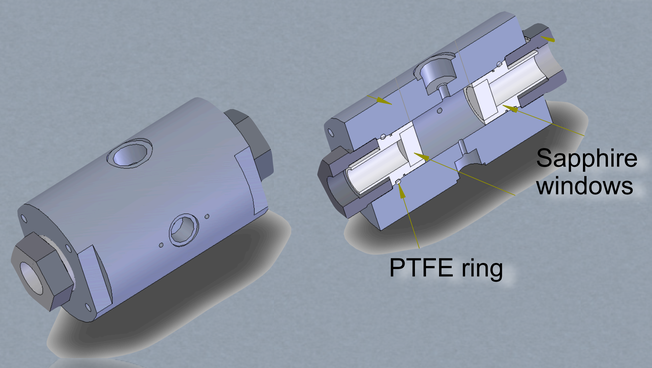


Figure 2: Schematic showing three interphases in contact.

Pressure vessel



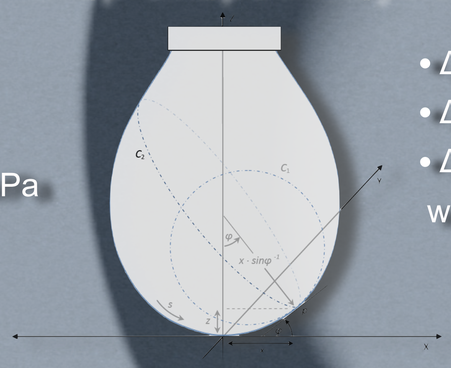
Condition range:

0.1 MPa < p < 70 MPa

291 K < T < 473 K

Figure 3: High pressure view cell.

Drop Shape Analysis



- $\Delta p_{apex} - \Delta p_p = z\,\Delta\rho\,g$
- $\Delta p_{apex} = 2\,\gamma\,k_{apex}$
- $\Delta p_p = \gamma\,(k_{1p} + k_{2p})$

where,

$k_{1p} = d\Phi / ds$

$k_{2p} = \sin\Phi / x$

Figure 4: Drop profile showing circles of curvature at any point “p”.

H_2O / CO_2

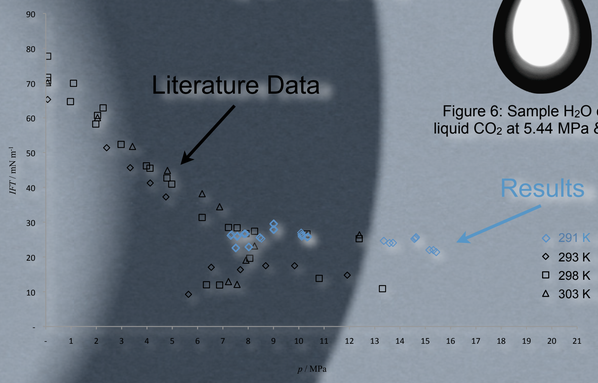


Figure 5: *IFT* - H_2O / CO_2 [subcritical]

Figure 6: Sample H_2O drop in liquid CO_2 at 5.44 MPa & 291 K.

Acknowledgments

Thermophysics Laboratory
Shell International Exploration and Production

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