UKCCS RESEARCH CENTRE

The University of Nottingham
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- Call 1 Project -
Measurement of Water Solubility Limits in CO_2 Mixtures

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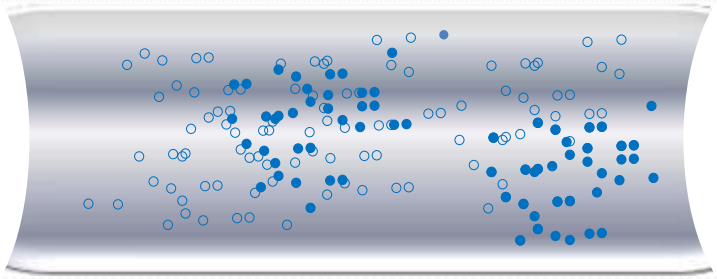
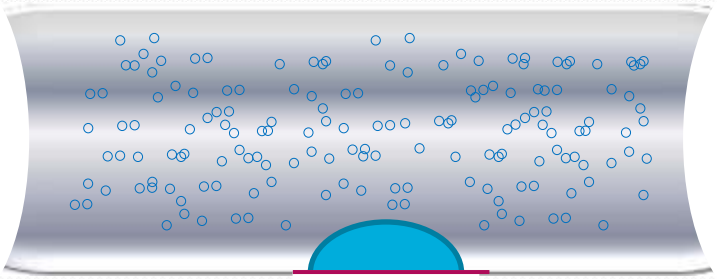
Context: CO_2 transport by pipeline

- Captured CO_2 will contain small percentages of impurities including gases such as N_2, H_2 or Ar and water*
- Understanding the phase behaviour of CO_2-rich mixtures is crucial

CO_2 + any H_2O must be in a single phase



If not…



Corrosion

*de Visser et al., Int.J.Greenh Gas Cont Vol.2, 2008, p.478.

Aim of our project

- To establish the solubility limit of water in impure CO_2 to ensure the safety of pipelines

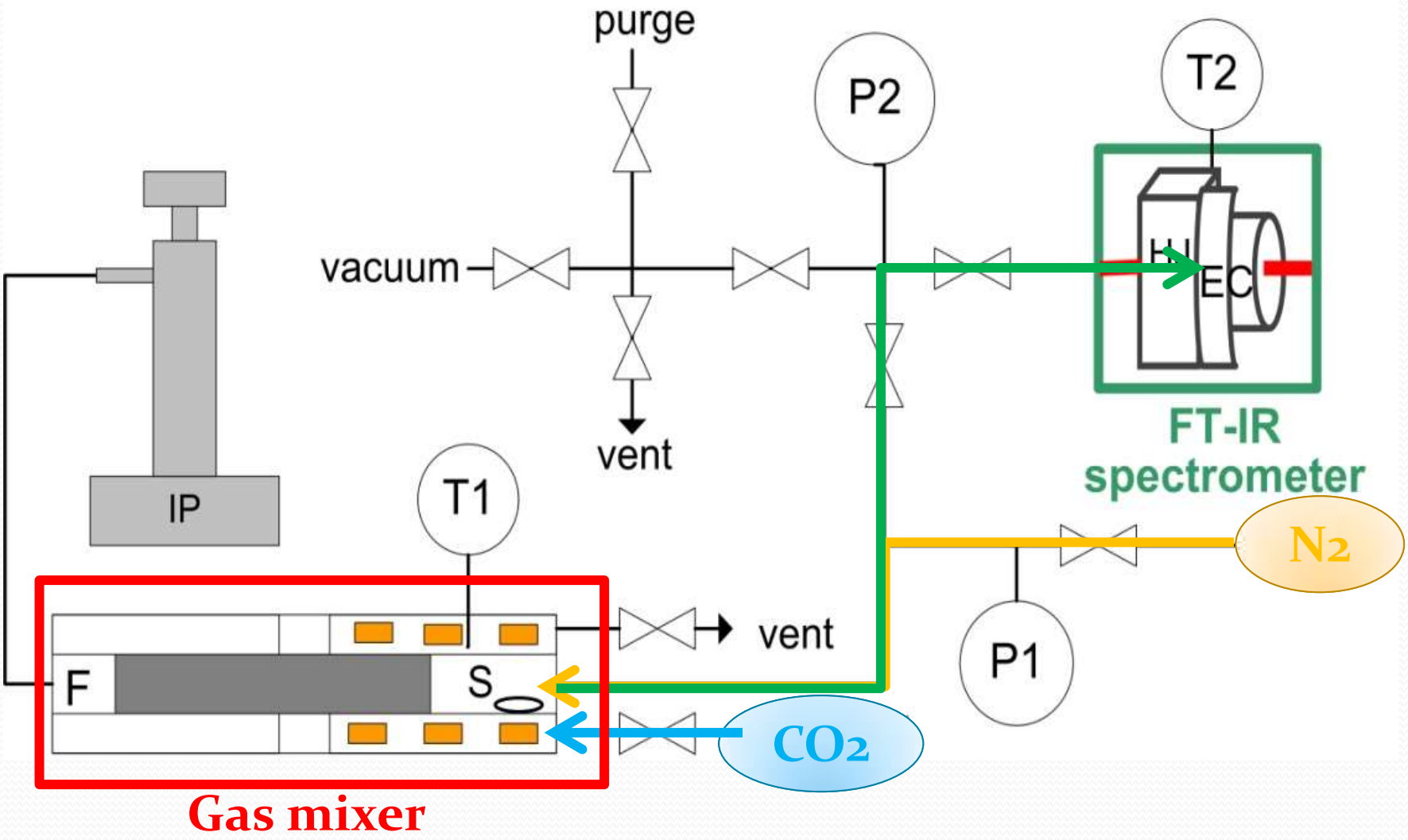
Strategy

- Using two independents methods

FTIR spectroscopy method*	Karl Fischer titration method
✓ (Call 1)	**In Progress (Call 2)**
○**Water highly absorbing in infrared;** ○**Long experience in the group coupling IR to high pressure device.**	○**Investigate lower temperatures.** ○**Confirm the results obtained by FTIR;**

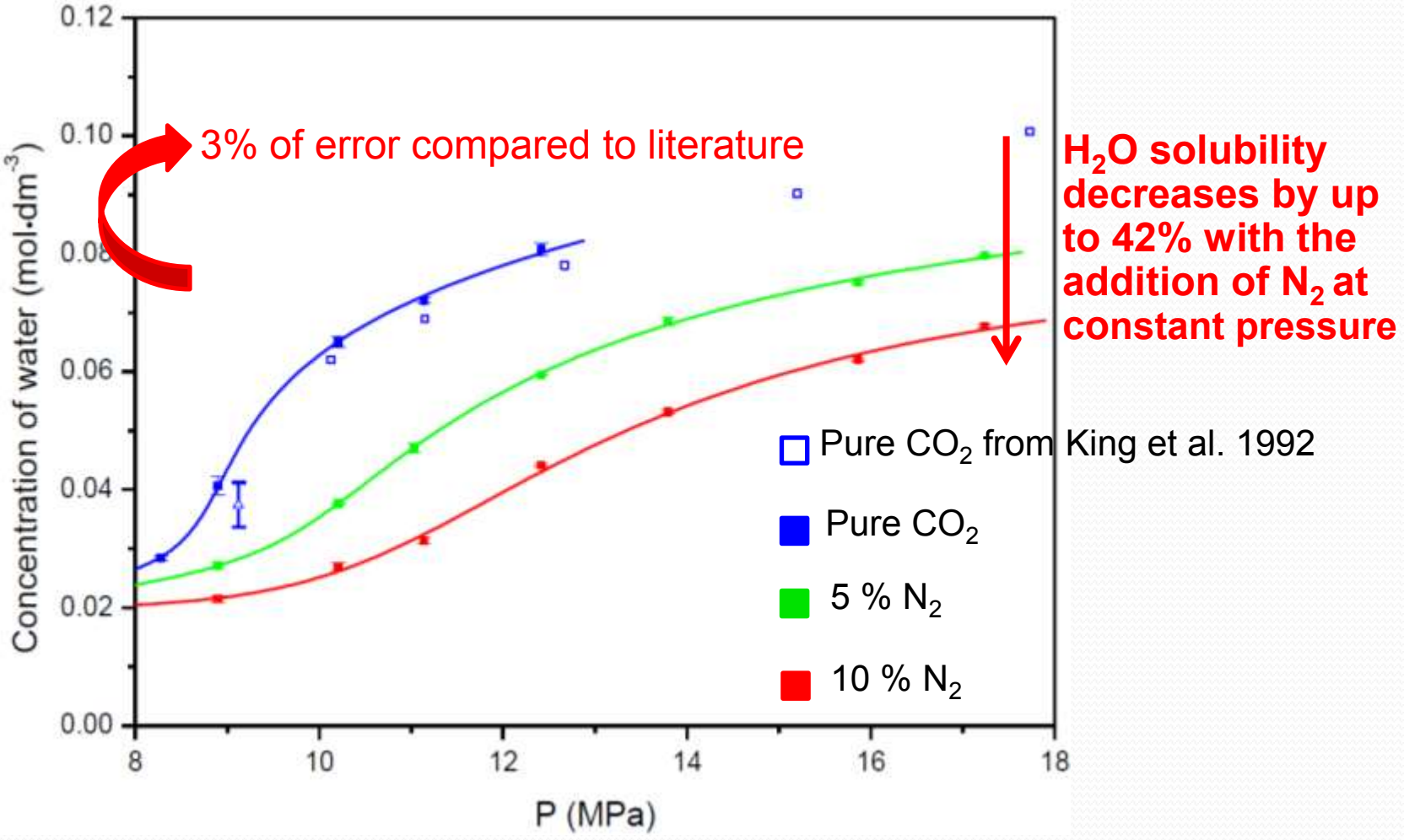
*S. Foltran, M.E. Vosper, N.B. Suleiman, A. Wriglesworth, J. Ke, T.C. Drage, M. Poliakoff, M.W. George, Int. J. Greenh.Gas Control, 35, (2015), p.131.

High pressure FTIR spectroscopic approach



Concentration of water in CO_2 mixtures

At = 40°C and P = 8 - 18 MPa in pure CO_2 and in CO_2 + (5-10%) N_2 mixtures



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Conclusions

- **For a fixed T and P, small percentages of N_2 can lower significantly the solubility of water in CO_2;**
- A simple FTIR technique has been developed to understand the phase behaviour of water in CO_2 containing impurities.

Outlooks

- Investigating water solubility in more complex mixtures, e.g. $CO_2 + H_2 + N_2$;
- Developments of another method to ensure our results.

Acknowledgements

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- Dr. Maria-José Tenorio
- Mark Guyler
- Workshop:
  - Richard Wilson
  - Peter Fields
- All the group

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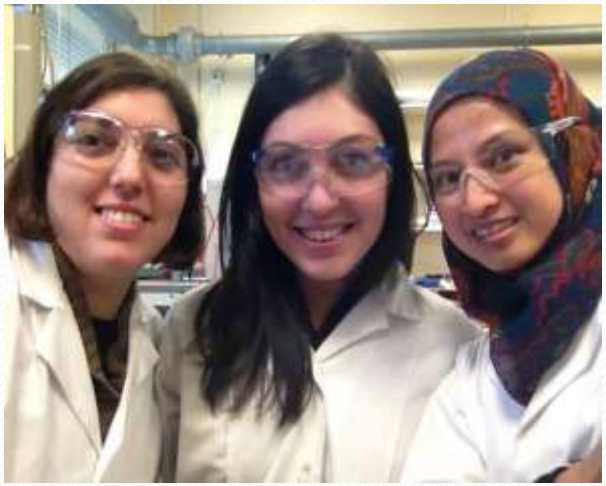

Thank you for your attention!