Personal details and contact info

Title	Full Name
Mr	Revelation Jacob Samuel

UCL e-mail address	Role in the department
ucecrjs@ucl.ac.uk	PhD scholar

Room	Phone number
204	02076793809

Education and awards

Education:

- BSc (Eng) in Chemical Engineering, Niger Delta University, Nigeria, 2009

- MSc in Chemical Engineering, UCL, 2013

- PhD (in view) in Chemical Engineering, UCL, 2019

Awards:

Best Poster prize, UKCCSRC conference, Sept 2017
Associate Fellowship Higher Education Academy (AFHEA) , July 2017
PhD Scholarship, Nigerian Government, Jan. 2015
Niger Delta MSc Scholarship, Shell Nigeria, Sept. 2012
Best graduating student Faculty of Engineering, July 2009
Shell Nigeria undergraduate scholarship, June 2006

Personal affiliations

Associate Member, Institute of Chemical Engineers, IChemE

Bio

Revelation J. Samuel was born in Nembe, Bayelsa State, Nigeria. Mr Samuel obtained an outstanding first degree (B.Eng) in Chemical Engineering from Niger Delta University, Nigeria in 2009 and M.Sc. in Chemical Process Engineering from UCL in 2013 after securing a fully funded scholarship award in 2012 from Shell Nigeria. He joined UCL Chemical Engineering department in 2015 as a Postgraduate Researcher after securing a fully funded scholarship award in 2014 from the Nigeria Government.

His main research areas include multiphase flow modelling, pipeline safety and risk management and Carbon Capture and Sequestration (CCS) supervised by Prof. Haroun Mahgerefteh.

Mr Samuel is a member of the Institute of Chemical Engineers (IChemE) and has published in various journals. He has excellent knowledge in computer programme such as Microsoft Office, MATLAB, GAMS, HYSYS, gPROMS, FORTRAN, ChemCAD etc.

Research interests

Project title

Transient Flow Modelling of Carbon Dioxide (CO_2) Injection into Depleted Gas Fields

Summary

The internationally agreed global climate deal reached at the Paris Climate Conference in 2015 is intended to limit the increase in global average temperatures to ‘well below’ 2°C above pre-industrial levels. This comes in addition to the European Union ambition for 80% to 95% reduction in the 1990 greenhouse gas emissions by 2050 in order to avoid dangerous climate change. Most scenario studies indicate that Carbon Capture and Storage (CCS) is essential for achieving such ambitious reductions. In CCS operations, depleted gas fields represent prime targets for large-scale storage of the captured CO_2. Considering the relatively low wellhead pressure of such fields, the uncontrolled injection of the high-pressure dense phase CO_2 will result in its rapid, quasi-adiabatic Joule-Thomson expansion leading to significant temperature drops. This could pose several risks, including blockage due to hydrate and ice formation following contact of the cold sub-zero CO_2 with the interstitial water around the wellbore and the formation water in the perforations at the near well zone, thermal stress shocking of the wellbore casing steel leading to its fracture and over-pressurisation accompanied by CO_2 backflow into the injection system due to the violent evaporation of the superheated liquid CO_2 upon entry into the wellbore.
In order to minimise the above risks and demonstrate best-practice guidelines for the injection of CO_2, the accurate predictions of the CO_2 pressure and temperature along the well during the injection process is of paramount importance. This study deals with the development and verification of a Homogeneous Equilibrium Mixture (HEM) model and a Homogenous Equilibrium Relaxation Mixture (HERM) model for simulating the transient flow phenomena taking place during the injection of CO_2 into depleted gas fields. The HEM model considers a two-phase mixture being injected to be at homogeneous equilibrium, assuming instantaneous interface mass, momentum and energy exchange. As such, the constituent gas and liquid phases are assumed to remain at the same pressure, temperature and velocity, and the corresponding fluid flow is described using a single set of mass, momentum and energy conservation equations. The HERM on the other hand presents an additional equation which accounts for the thermodynamic non-equilibrium relaxation time in two-phase multi-component mixtures. It also accounts for phase and flow dependent fluid/wall friction and heat transfer, variable well cross sectional area as well as deviation of the well from the vertical. At the well inlet, the opening of the upstream flow regulator valve is modelled as an isenthalpic expansion process; whilst at the well outlet, a formation-specific pressure-mass flow rate correlation is adopted to characterise the storage site injectivity.

Supervisors

1. Prof Haroun Mahgerefteh	2. Dr. Michail Stamatakis	3.

Publications

1. Revelation J. Samuel and Haroun Mahgerefteh, (2017).
Transient Flow Modelling of Start-up CO2 Injection into Highly-depleted Oil/Gas Fields.
International Journal of Chemical Engineering Applications, Vol. 8, No. 5, pp. 319 – 326.

2. Revelation J. Samuel and Haroun Mahgerefteh, (2019)
Investigating the impact of flow rate ramp-up on Carbon Dioxide start-up injection.
International Journal of Greenhouse Gas Control, (Under Review)

Teaching

PGTA in IEP, Design and Professional Skills 1

Research group

Additional information