

# LABWORK MATTERS

Supporting the Energy Industry



# CLEAN TECHNOLOGY SHAPING THE ENERGY FUTURE

Our multidisciplinary team of petroleum, mechanical, electrical and software engineers strives to offer high quality, state-of-the-art, fast and flexible laboratory services for the energy industry. Whenever possible, we integrate industry leading microfluidic technology into our laboratory workflows to:

- ▮ Deliver experimental results up to **200 times faster**
- ▮ Significantly **reduce cost**
- ▮ **Accelerate field implementation** and **reduce field implementation risk**
- ▮ Substantially **reduce required reservoir fluid volumes**
- ▮ Minimise laboratory and **environmental footprints**
- ▮ Provide **visual access** to multi-phase flow and fluid interfaces

## OUR SERVICE PORTFOLIO

We have invested in a fully equipped laboratory that puts us in a position to perform laboratory experiments using gases such as hydrogen, carbon dioxide and hydrogen mixtures at reservoir conditions in compliance with highest HSE regulations.

**Complex Fluid Characterisation:** PVT, MMP, chemical reactions tracking, flow assurance and asphaltene precipitation studies, complex rheology.

**SCAL:** Straight from the drilling campaign to the lab. Plug preparation, routine-core-analysis, petrophysical properties, relative permeabilities and capillary pressure measurements.

**IOR/EOR:** Comprise petrophysical, fluid-fluid/fluid-rock investigations and core flooding.

**goGreen:** Hydrogen and CO<sub>2</sub> utilisation and storage (CCS/CCU). Support the energy transition with gas synthesis & characterisation and measurements of gas-rock and gas-rock-fluids interactions.

**Customised Solutions:** Design, manufacturing and provision of customised laboratory equipment based on client requirements.

### CHARACTERISATION OF COMPLEX FLUIDS - IOR/EOR, HYDROGEN STORAGE, CCS, UGS

#### FLUID PREPARATION AND CHARACTERISATION

- ▮ Multicomponent solution gas synthesis (H<sub>2</sub>, N<sub>2</sub>, CO<sub>2</sub>, C<sub>1</sub>-C<sub>8</sub>) and recombination of formation brine with gas mixtures
- ▮ Preparation of synthetic formation brines and complex chemical EOR solutions (incl. viscosity, density, pH, electric conductivity, plus any special request such as moisture content of chemical powders)
- ▮ Multicomponent solution gas synthesis and physical recombination with oil or brine
- ▮ Reservoir bottom-hole or synthetic fluid sample analysis. Oil-gas-brine composition, PVT, conventional MMP, flow assurance studies, solubility of gas mixtures, handling and storage, live fluid viscosity and density

#### HPHT MICROFLUIDICS TECHNOLOGY PLATFORM (InspIOR®)

- ▮ PVT, MMP, CCE, live fluids viscosity, flow assurance and asphaltene precipitation

## CORE HANDLING, RCA, SCAL AND PETROPHYSICAL SERVICES

- ▮ Core and plug preparation, cleaning and storage
- ▮ FTIR, XRD, XRF, (FIB)-SEM with EDS, ( $\mu$ )CT, microscopic imaging, digital core photography
- ▮ Grain density, permeability and porosity
- ▮ Core, plug and thin section description including lithology, texture, grain size, detrital mineralogy, authigenic components, porosity types, reservoir quality, formation damage



## MAXIMISING HYDROCARBON RECOVERY

### IOR/EOR SERVICES – FROM ROUTINE TO TAILORED SOLUTIONS

#### FLUID-FLUID & ROCK-FLUID INTERACTIONS

- ▮ Phase behaviour tests at ambient & reservoir conditions
- ▮ HPHT interfacial tension and contact angle
- ▮ Streaming Potential, BET adsorption, Cation Exchange Capacity (CEC)
- ▮ Spontaneous drainage and imbibition tests
- ▮ Injectivity and tracer tests

#### EOE CORE FLOODING

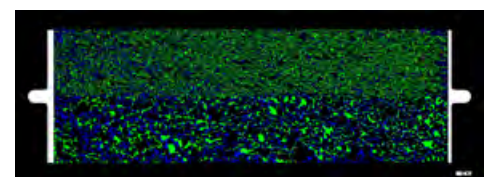
- ▮ EOR flooding with live or dead fluids under reservoir conditions using pressure tapped tri-axial core holders
- ▮ Comprehensive effluent analytics such as ions, Total Organic Carbon (TOC), oil and gas composition, concentration of ASP and nano particles
- ▮ Numerical simulation

#### HPHT MICROFLUIDICS TECHNOLOGY PLATFORM (InspIOR®)

- ▮ Customised chip design and construction
- ▮ EOR micromodel flooding: chemical (P, A, S, AP, SP, ASP, nano particles), microbial, gas injection, thermal



Heterogeneous (high & low perm) permeability micromodel extracted from a  $\mu$ CT image of a Bentheimer sandstone (blue = water, green = oil)







## ACCELERATING THE ENERGY TRANSITION

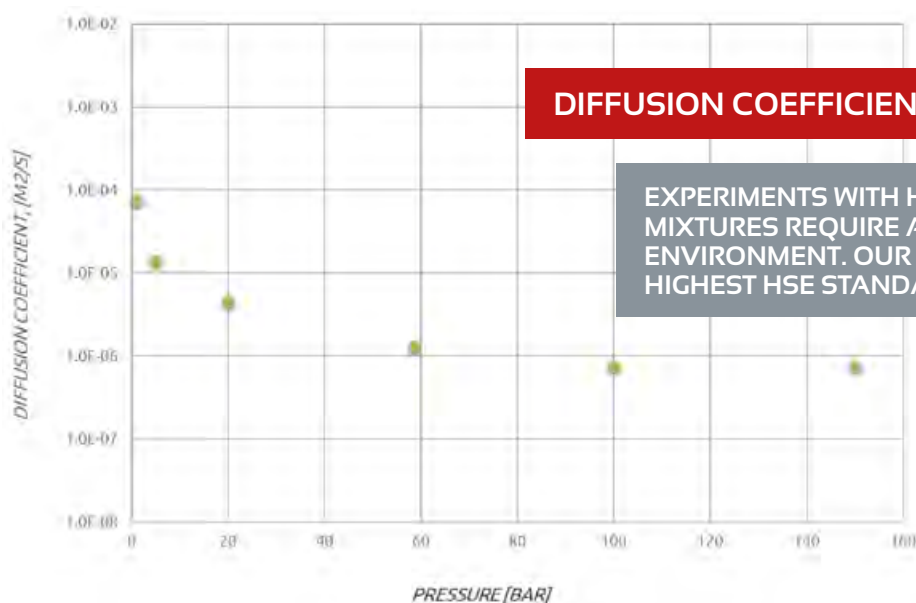
### CHARACTERISATION OF COMPLEX FLUIDS - HYDROGEN STORAGE, CCS, UGS

#### GAS-ROCK-FLUID INTERACTIONS

- HPHT interfacial tension and contact angle
- Compatibility of gas mixture, brine and rock in HPHT batch reactor and geochemical simulation
- Injectivity testing
- Geomechanics
- HPHT gas mixing during natural gas and hydrogen storage in salt caverns and porous reservoirs
- Diffusion of gas mixtures including hydrogen (H<sub>2</sub>) through reservoir and cap rock samples as well as cement, salt, completions and flowlines at reservoir conditions
- Capillary entry pressure
- Quantification of hydrogen losses
- Numerical simulation

#### HPHT MICROFLUIDICS TECHNOLOGY PLATFORM (InspIOR®)

- Micromodel flooding: CO<sub>2</sub> and H<sub>2</sub> injection, methanisation, bacterial growth, viscous fingering, residual saturations etc.



### DIFFUSION COEFFICIENT THROUGH POROUS MEDIA

EXPERIMENTS WITH HYDROGEN AND HYDROGEN MIXTURES REQUIRE A SAFE AND RELIABLE LAB ENVIRONMENT. OUR STATE-OF-THE-ART LABS OFFER HIGHEST HSE STANDARDS

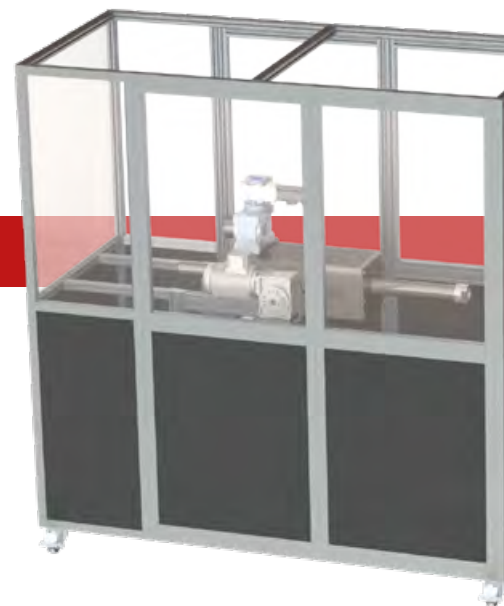


## InspiOR®: TURNKEY MICROFLUIDIC TECHNOLOGY PLATFORM

### CUSTOMISED SOLUTIONS

- ▮ Manufacturing of bespoke components and systems
- ▮ Design of microfluidic and coreflooding rigs, gas diffusion, PVT systems, and many more
- ▮ Professional consultancy for lab equipment manufacturing
- ▮ Turnkey solutions and short delivery times
- ▮ InspiOR® family, state-of-the-art and turnkey microfluidic technology platform

### STATE-OF-THE-ART PVT SYSTEM



**UP TO 200x TIMES FASTER  
THAN CONVENTIONAL LABS!**

Contact us at [fluidXlab@hoteng.com](mailto:fluidXlab@hoteng.com) or visit us at [fluidXlab.com](http://fluidXlab.com)




## LOOKING FOR A PARTNER WHO'LL MAKE A DIFFERENCE?

[www.fluidXlab.com](http://www.fluidXlab.com)  
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