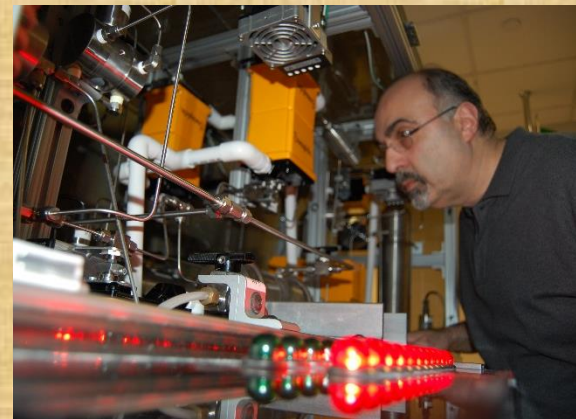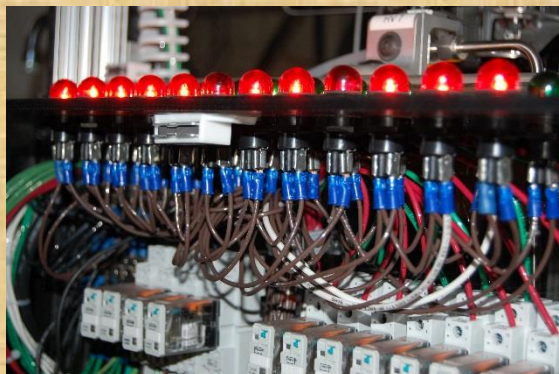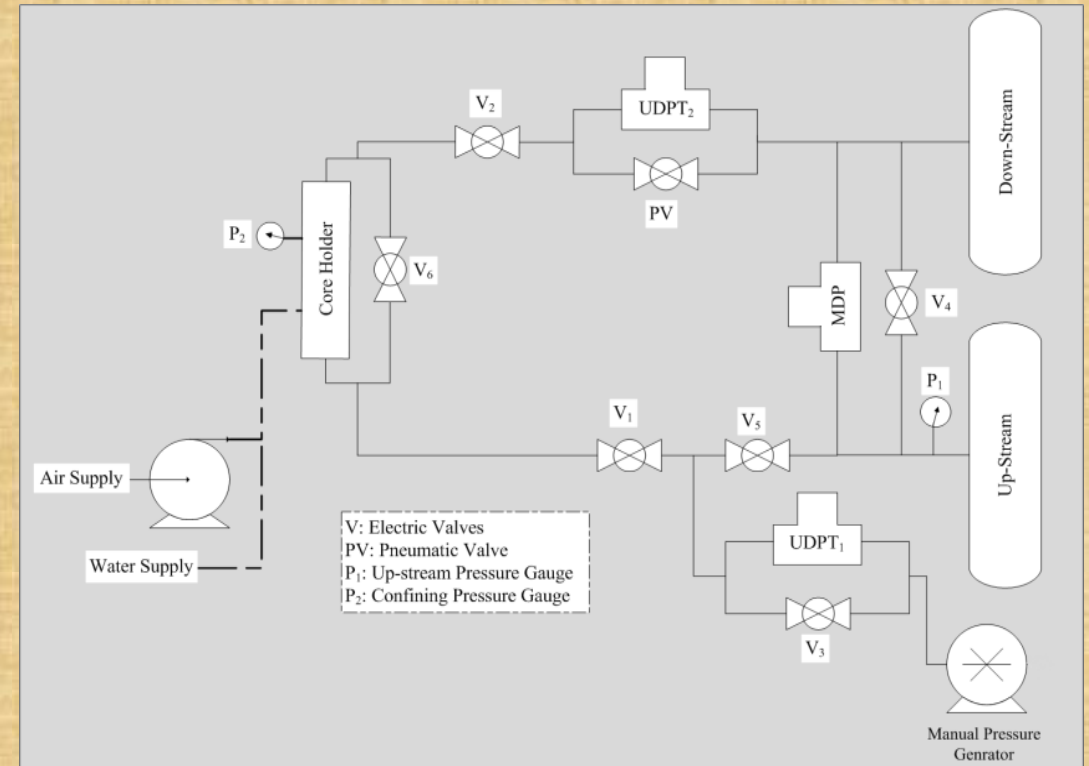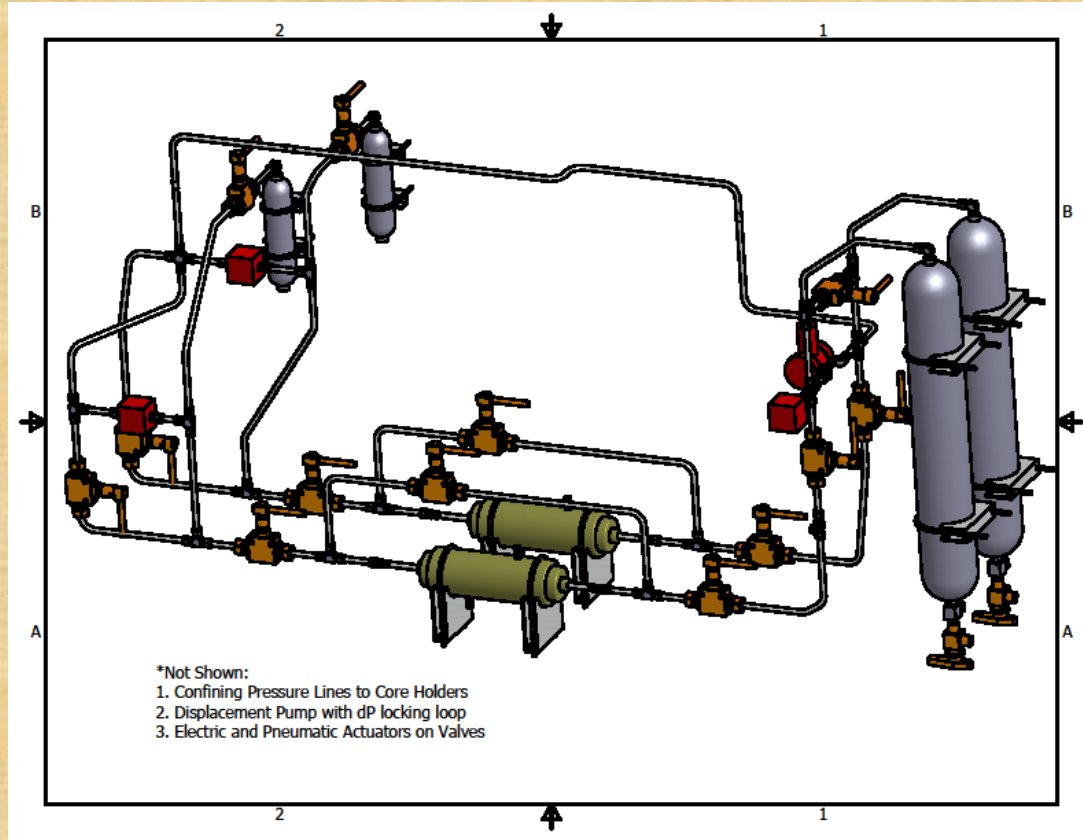# Precision Petrophysical Analysis Laboratory (PPAL)

# Precision Petrophysical Analysis Laboratory

Schematic of PPAL

Capabilities

- Simulating reservoir conditions such as pore pressure, overburden pressure, and temperature.

- Simulating steady state gas flow through the core plug.

- Measuring permeability with accuracy of nano-darcy.

- Measuring pore volume(~0.1% accuracy for porosity)

- Instantaneous pressure recording with accuracy of 0.001 psi.
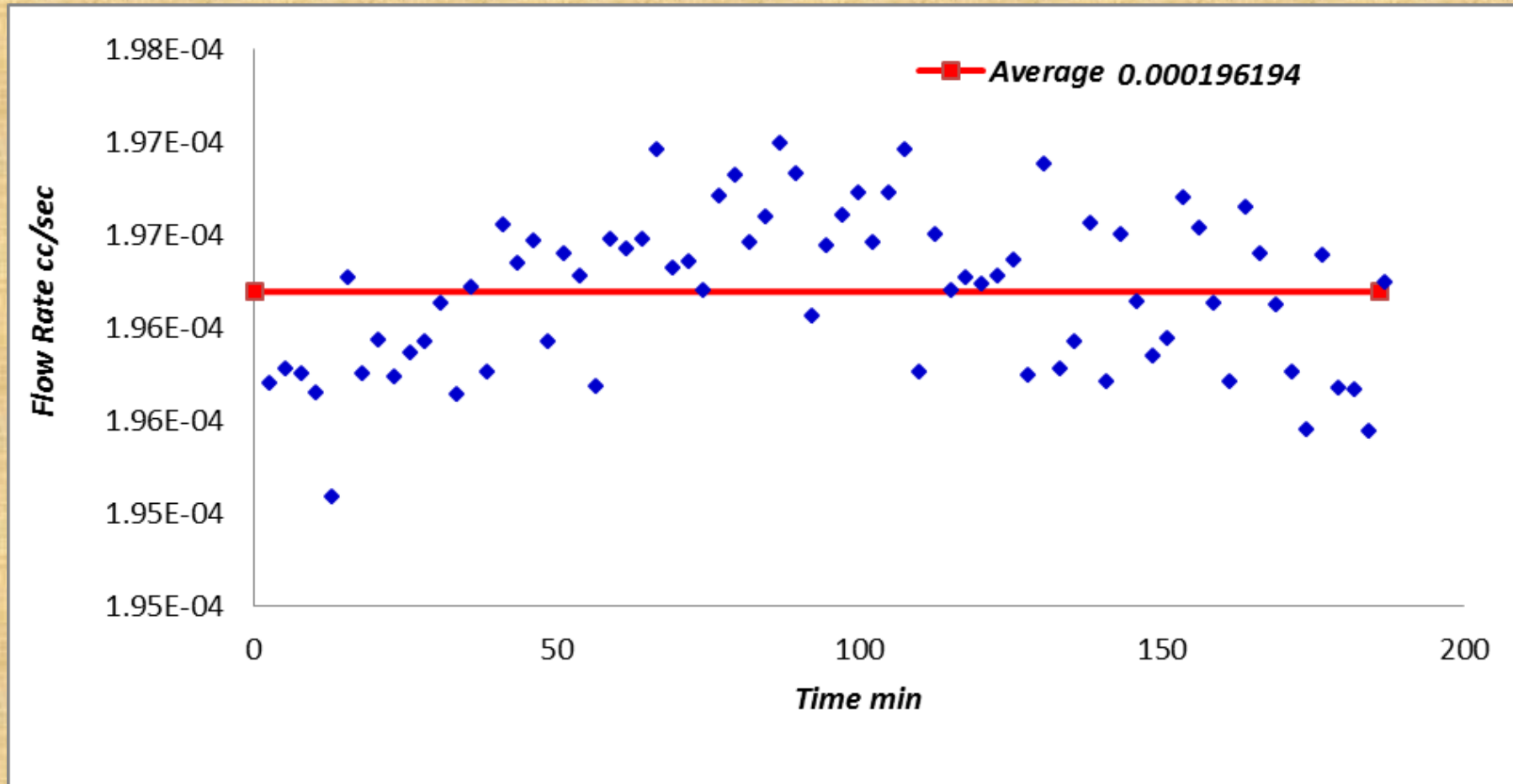
Core Holder Assembly and Core Plug Sample
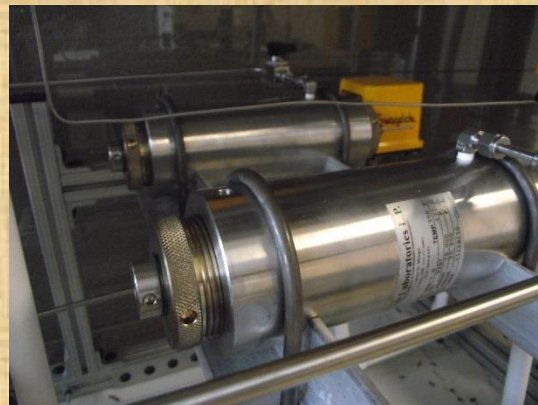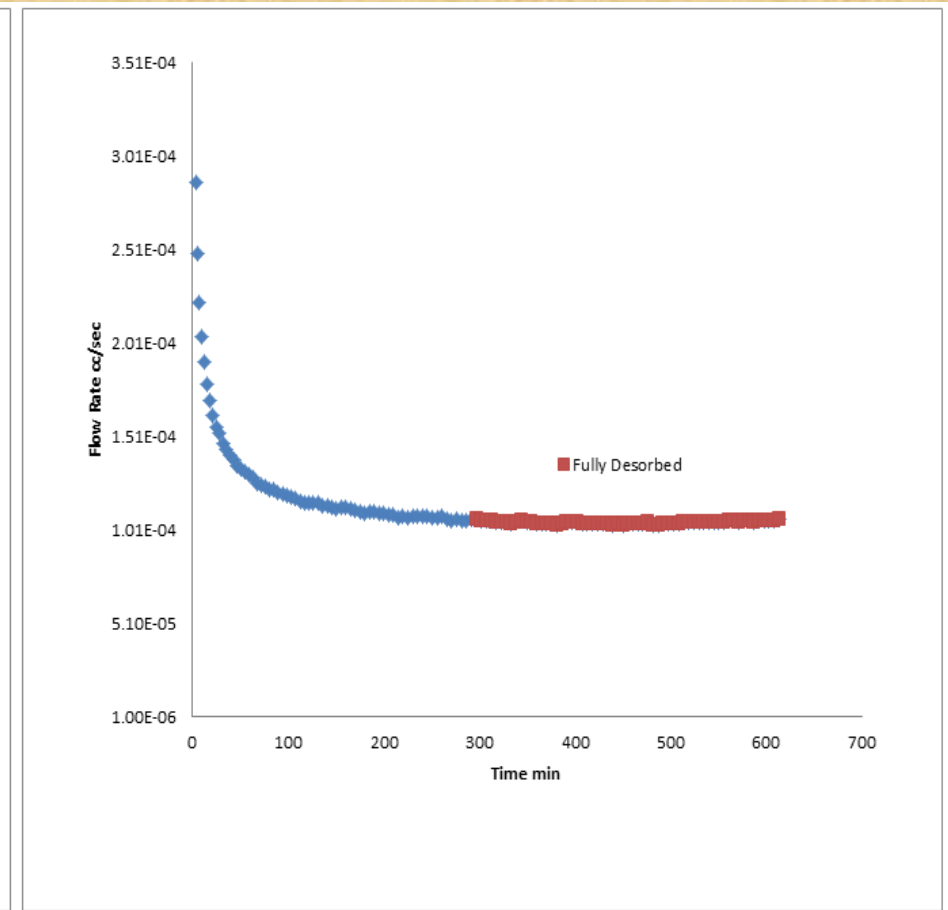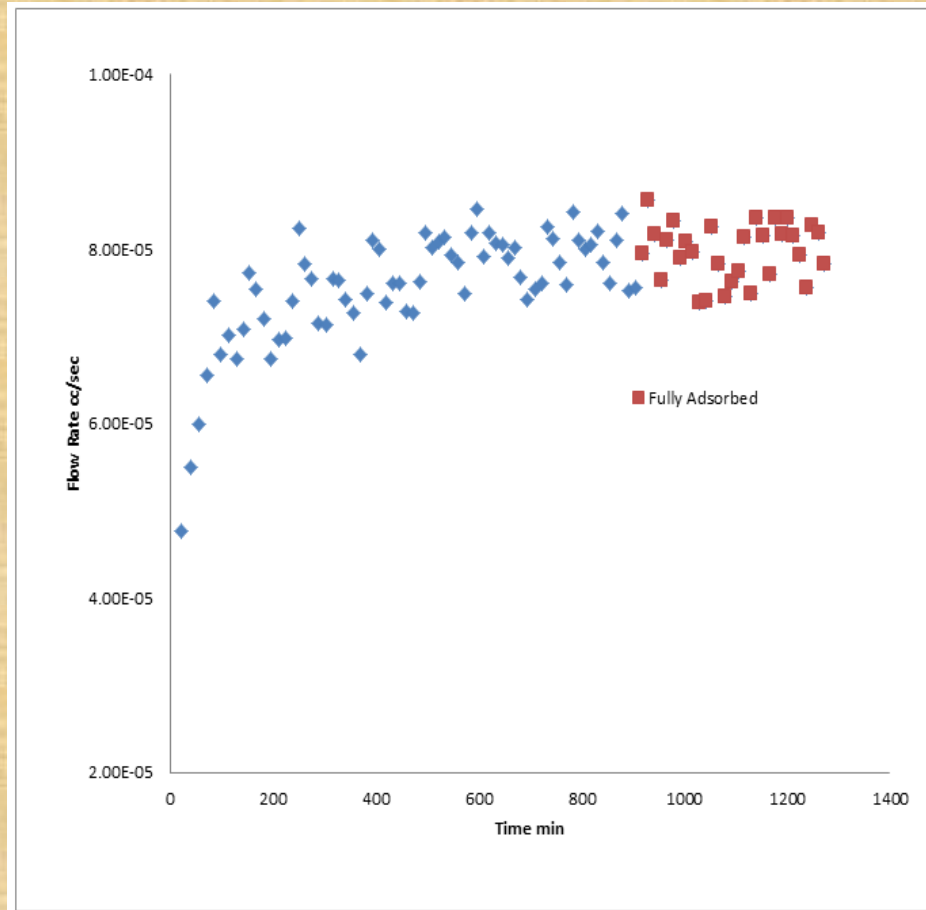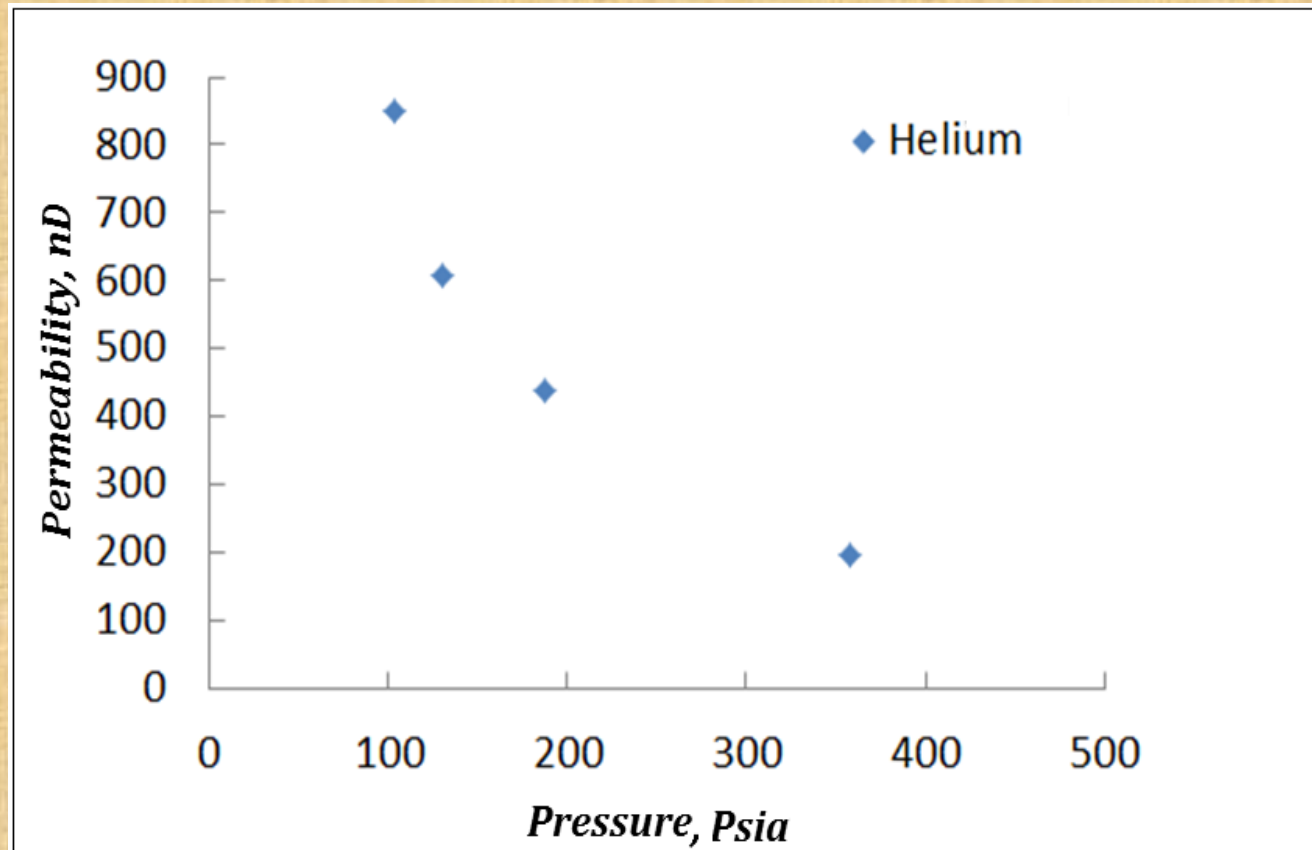
Permeability Measurement
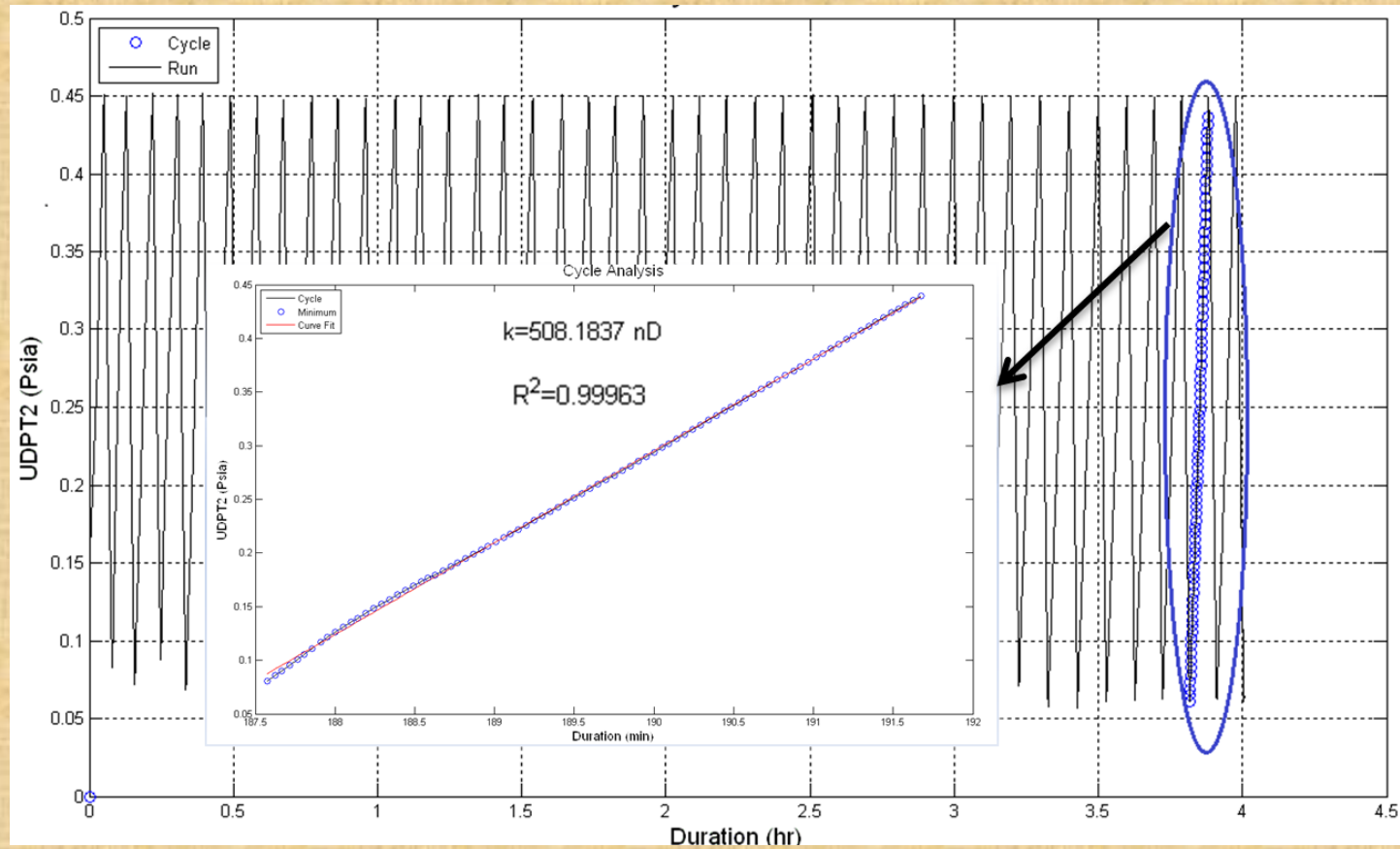
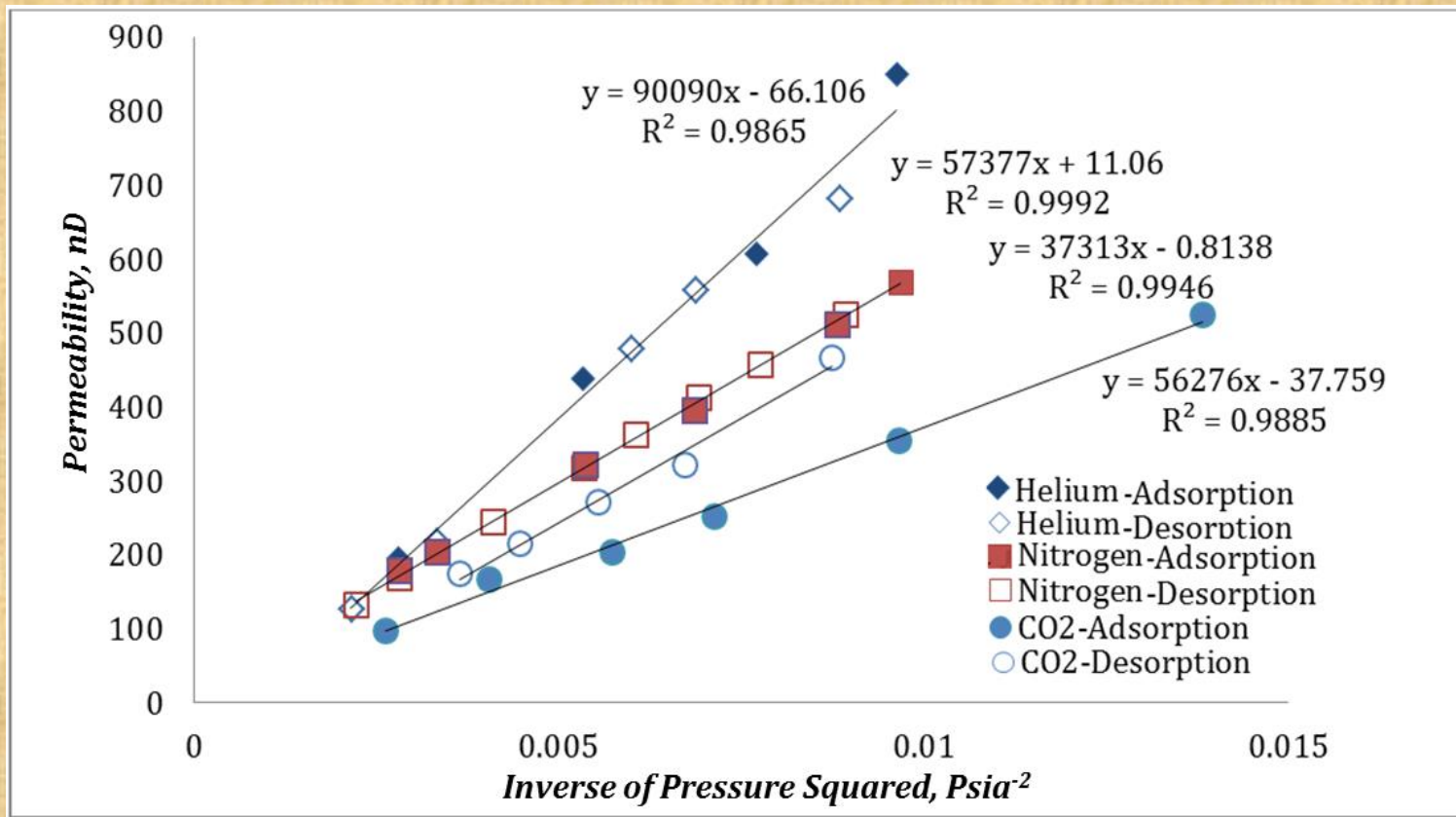# Flow Rate Measurement
He - No Sorption

Flow Rate Measurement
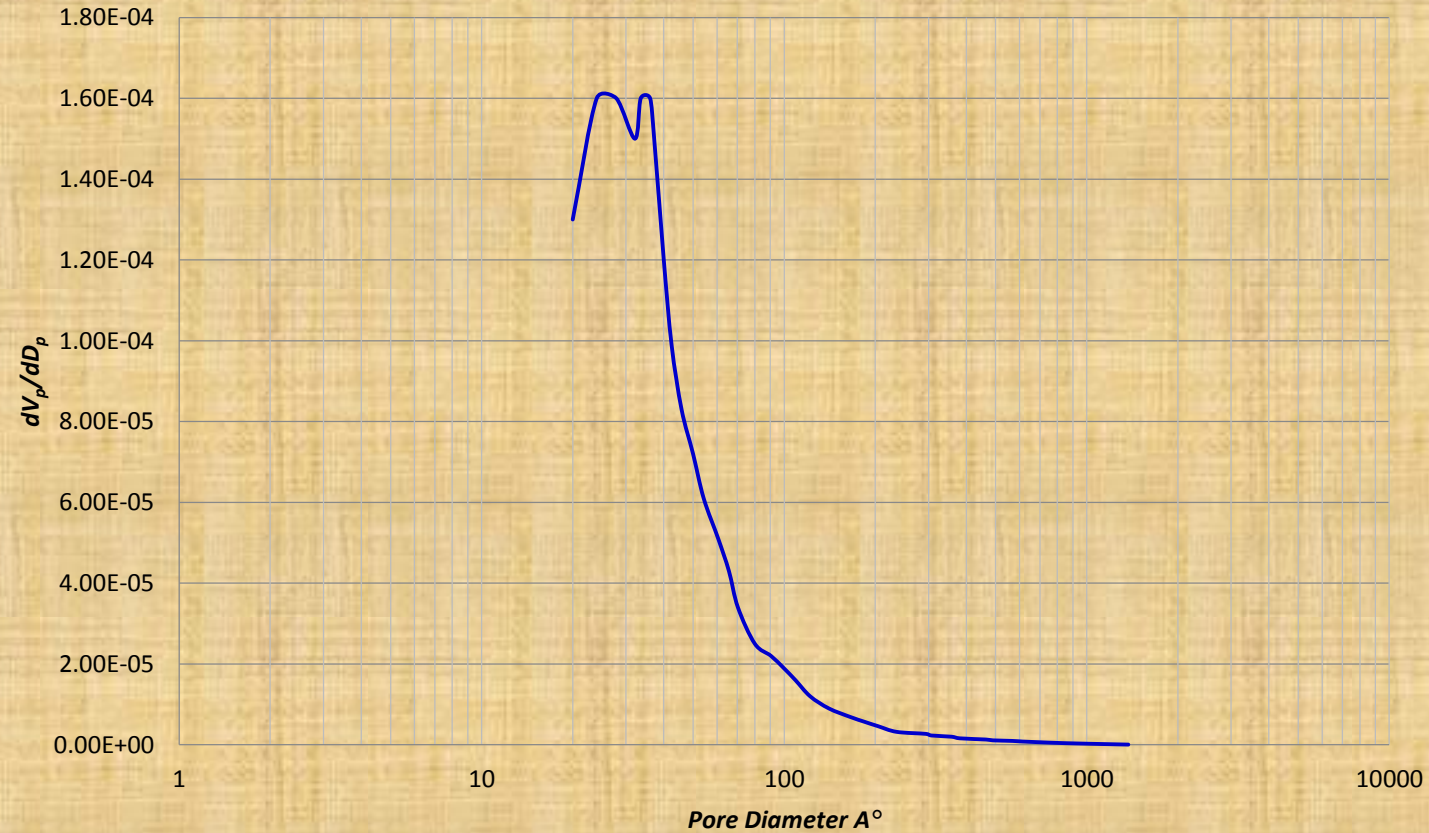## CO_2 - Sorption

Permeability Measurements Marcellus Shale

Klinkenberg Correction

Pore Size Distribution
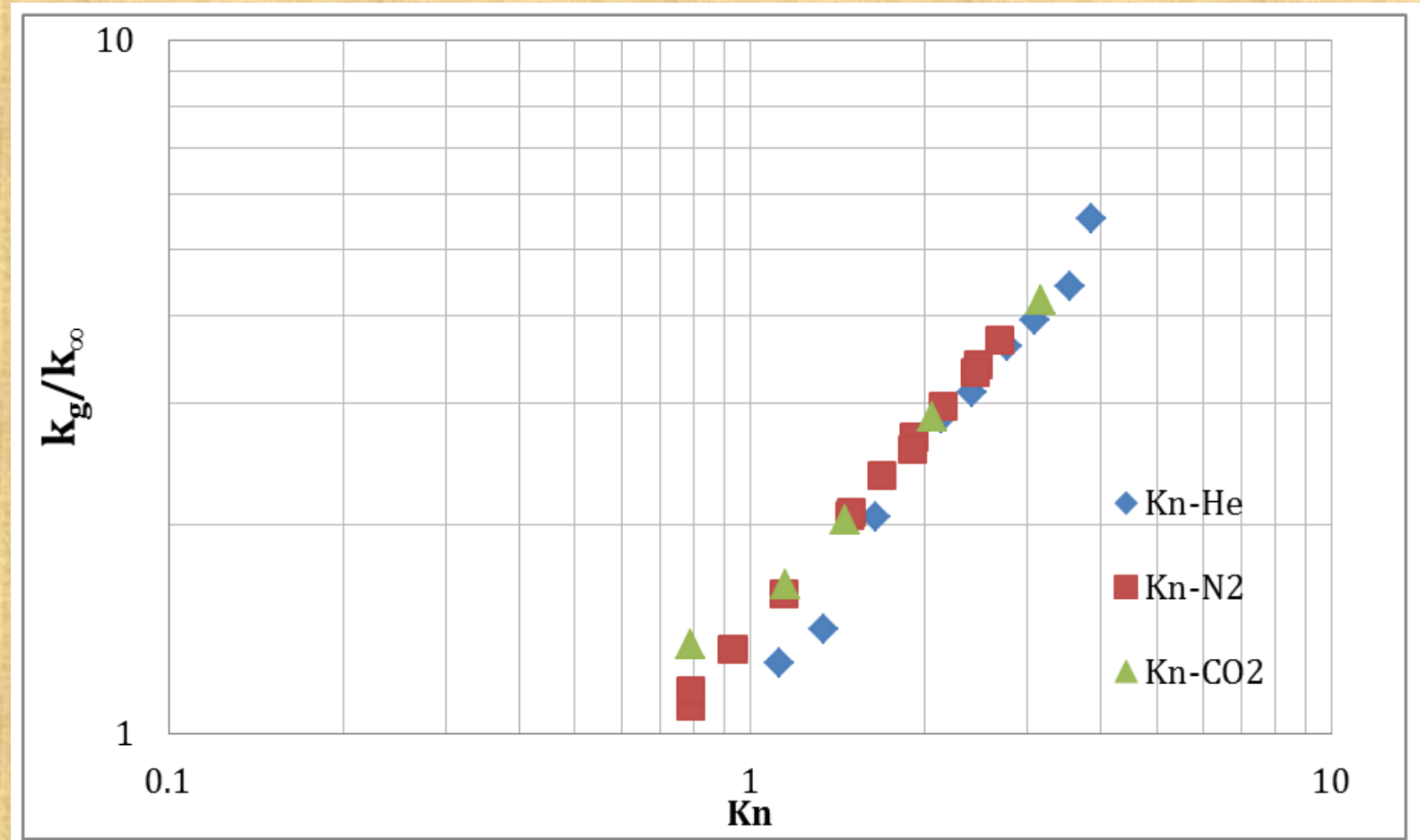## Obtained Using Nitrogen Adsorption At 77°k

The Average Pore Size is 3 Nanometer.

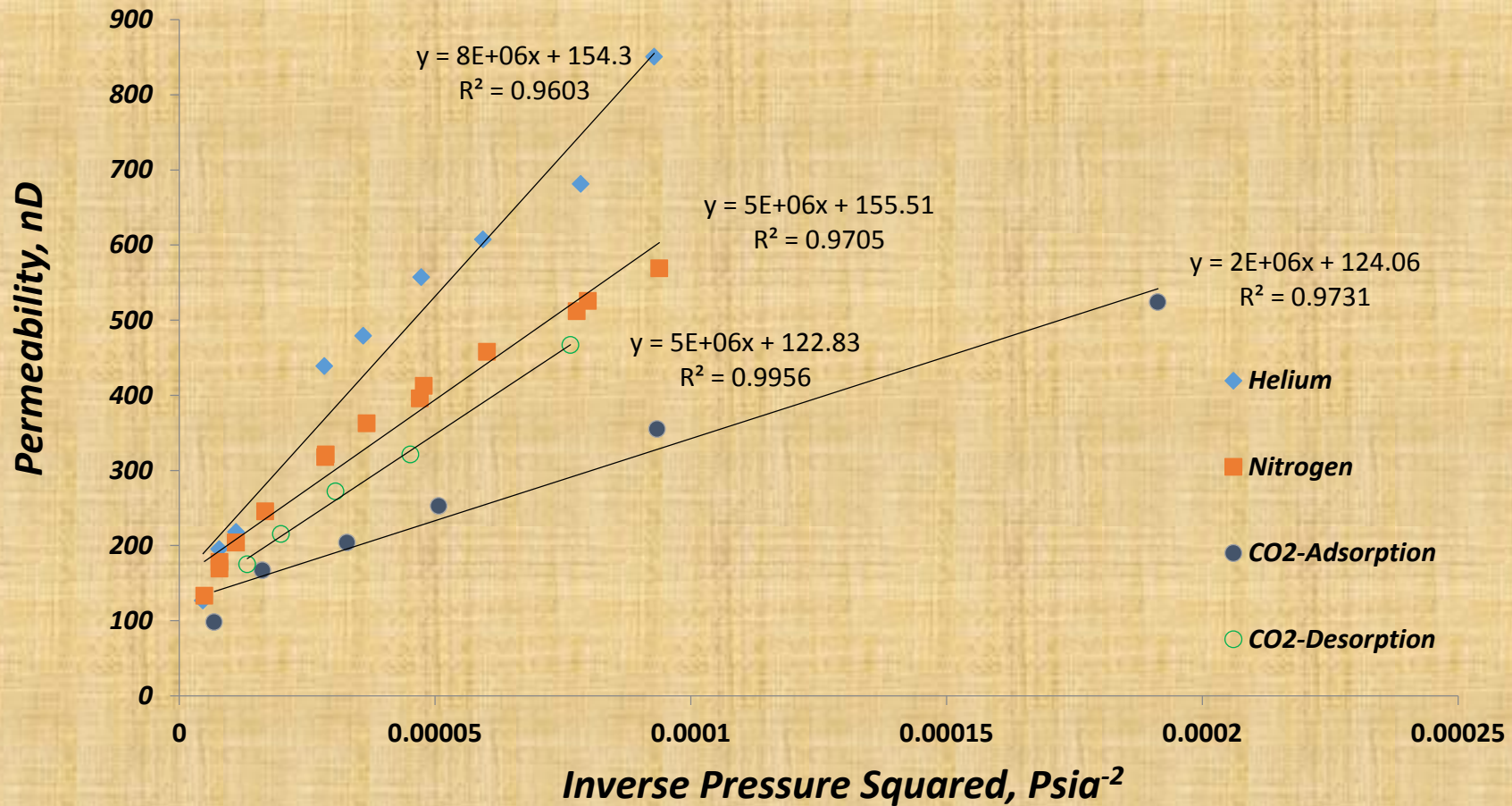# Normalized Permeability vs. Knudsen Number

$K_n < 0.001$
Continuum Flow

$0.001 < K_n < 0.1$
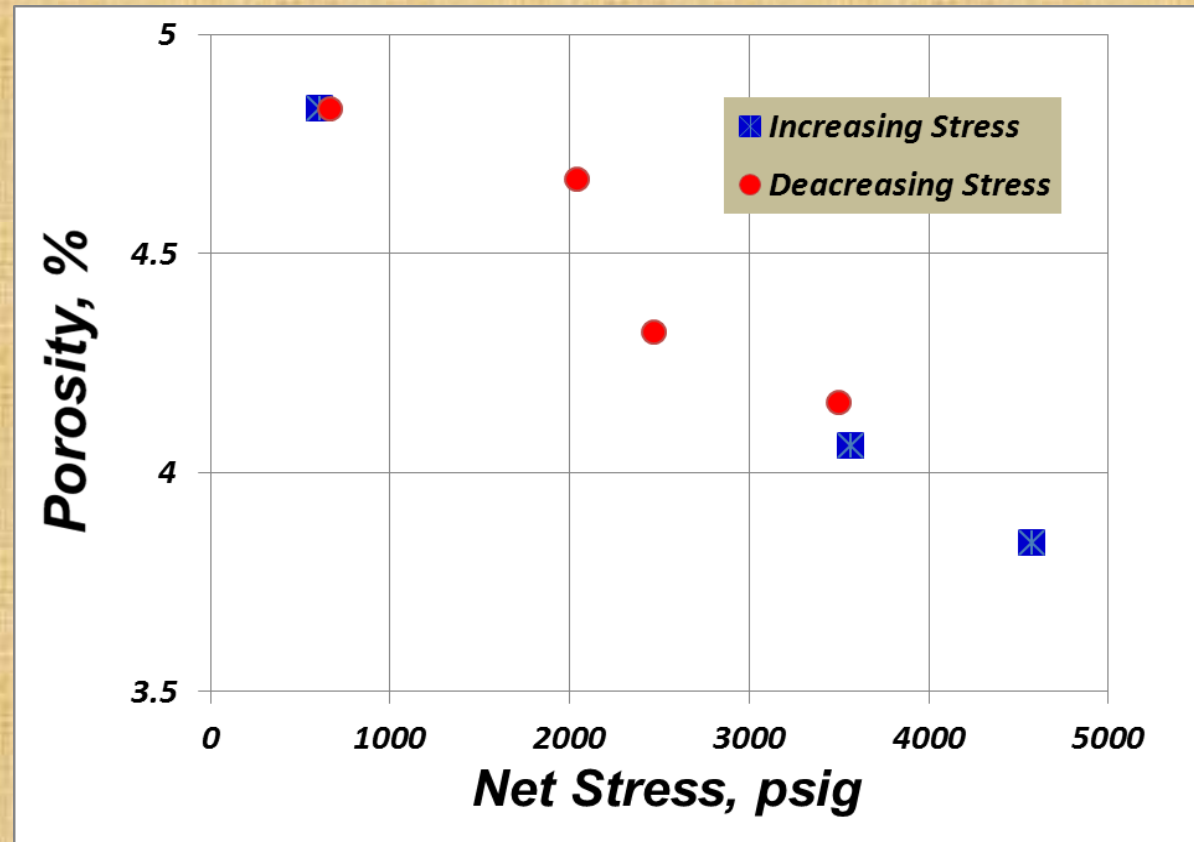**Slip Flow**

$0.1 < K_n < 10$
Transition Flow

$K_n > 10$
Free Molecular Flow

Double-slippage Correction

Effect of Net Stress on the Porosity
Measurements with N_2

Effect of Net Stress on the Permeability
Measured by N_2 and CO_2