

# Manju Pharkavi Murugesu

17611, W 16<sup>th</sup> Avenue, Apt. 300,  
Golden, 80401 Colorado, United States

Phone: +1(720)-8911407  
E-mail: mmurugesu@mymail.mines.edu

## EDUCATION

### Colorado School of Mines – Colorado, United States

Major: Petroleum Engineering

Advisor: Dr. Manika Prasad

**MSc. Dec 2018**

CGPA: 4.00

### Colorado School of Mines – Colorado, United States

Major: Petroleum Engineering

Minor: McBride Honors Program in Public Affairs

**B.S. May 2017**

Major CGPA: 4.00

CGPA: 3.98

### Honors Student - McBride Honors Program

Develops core skills in effective communication, problem solving, leadership, and critical thinking while exploring complex issues of the world. Encompasses intensive reading, professional writing, oral presentations and active weekly forums.

## RELEVANT EXPERIENCE

### Reservoir Simulation

*(Fall 2017)*

- Numerical solution of flow in petroleum reservoirs by Finite Difference (FD) and control volume FD
- Building multiphase water flooding flow models for 1D and 2D with directional permeability.

### Enhanced Oil Recovery Externship (Internship Based Program)

*(Summer 2016)*

- Data mining, EOR screening process, technical training on EOR technologies, EOR Economics.
- Evaluated oil recovery equation, Pore to Pore Displacement Efficiency and Volumetric Sweep Efficiency.
- Gas and chemical EOR laboratories; Nebraska field facility tours.
- CMG Numerical simulation (black oil/compositional) including fluid characterization and sensitivity analysis.

### Undergraduate Research Assistant (RA)

*(Sept 2015 – May 2017)*

- Involved in CO<sub>2</sub> management project with the Department of Energy (DOE).
- Analysis of rock physics and pore characterization (specific surface area, pore size distribution, total pore volume, pore geometry) in OCLASSH (Organic, Clay, Sand and Shale) Laboratory.
- Gas adsorption with various adsorptives on rock samples: Bakken, Eagle Ford, Woodford, Niobrara, Berea, Najmah Kuwait, Lokpanta Oilshale Nigeria, Hawaiian Basaltic Rock, Utica, Monterey, Smectite, Illite, Montmorillonite, etc.

### Research Fellowship – Reservoir Characterization

*(Sept 2016 – May 2017)*

- Investigating preferential wetting in complex mineral systems of unconventional shales and mudrocks using polar and non-polar fluids.
- Accomplishment - Champion of SPE Rocky Mountain North America Regional Student Paper Contest and presented in SPE International Student Paper Contest.

## SKILLS & SPECIAL TRAINING

### Technical Software

- Kappa Saphir, Value Navigator, Surfer, Techlog, SolidWorks, Comsol, SAS Data Analysis, Petrel
- Numerical Simulations (CMG) – BUILDER, STARS, CMOST (sensitivity analysis), IMEX (waterflooding)

### Programming Skills

- VBA, Matlab, SGEMS, C++ (Introduction), Labview (Introduction)

### Special Training

- Wild Well Control Certified, Chevron Training: Artificial Lift Training, Decline Curve Analysis (Value Navigator)

### Economics

- Microeconomics, Economics & Technology, Petroleum Economics

## LEADERSHIP AND HONORS

PETRONAS Education Sponsorship - 2012 to 2017  
Petroleum Engineering Department - E-days Engineer Award (Outstanding Senior Award - Class of 2017)  
McBride Honors Program – The Thomas Philipose Outstanding Senior Award  
Consecutive Dean Lists – 2013 to 2017  
Society of Petroleum Engineers (SPE) – Students' Awards Director (Elected Officer)  
International Students Council (ISC) – Secretary (Elected Officer)  
Alpha Phi Omega Service Organization (APO) – Leadership Committee Member  
American Association of Drilling Engineers (AADE) – Active Member  
Pi Epsilon Tau Petroleum Engineers Honors Society – Mentor  
Malaysian Student Association (MySA) – Active Member

## ENGINEERING PROJECTS

### Petroleum Engineering Field Sessions I & II

- **Oil & Gas Industry Review** → Observed various processes in oil and gas field, comparing business models of more than 10 oil and gas companies in Colorado, New Mexico and Texas. *(Summer 2015)*
- **Geologic Field Trip to Massadona, Colorado** → studied surface and subsurface data to investigate complexity of depositional system in context of reservoir development and management. *(Summer 2016)*

### Evaluating Feasibility and Profitability of Producing from Paradox Basin of Western Utah

- Multidisciplinary senior design project (Role: Team Leader, Geology Liaison and Petrophysicist)
- Reserve estimation through analogue wells (includes complete log interpretation using Techlog), CMG numerical simulation, decline curve analysis, material balance and volumetrics.
- Created cash flow models to determine profit; designed drilling plan and sustainable development.

**Drilling Simulator** → Operated computer controlled, full-scale drilling rig simulator.

## COMMUNITY SERVICES

### Mount Saint Vincent Volunteer

*(Jan-June 2016)*

- Treatment center for children with behavioral, emotional challenges from traumatic and abusive past.

### Educational, Welfare and Research Foundation Malaysia - Education Intern

*(May to Aug 2015)*

- Taught English to Malaysian elementary students from rural school. Enhanced communication skills, leadership skills and flexibility while confronted with students with different challenges in learning a foreign language.

**Alpha Phi Omega (Service Fraternity)– Active Member**

*(Aug 2015 – May 2017)*

## OTHER EMPLOYMENT

### McBride Honors Writing Fellow – Writing Tutor at Writing Center

*(Sept 2015 – May 2017)*

- Trained on professional writing and presentation skills; tutor undergraduates to graduate students on writing and presentation related assignments; outreach of writing tutoring services to the campus.

### Conference Services Intern - Colorado School of Mines

*(May to Aug 2014)*

- Customer services, front desk, conference management, teamwork.

**Residence Life Desk Assistant**

*(Aug 2014 – Sept 2016)*

## List of Publications

### Peer-Reviewed

1. Revil, A., Murugesu, M., Prasad, M., & Le Breton, M. (2017). Alteration of volcanic rocks: A new non-intrusive indicator based on induced polarization measurements. *Journal of Volcanology and Geothermal Research*, 341, 351-362.
2. Murugesu, M. P. (2017, October). Pore Structure Analysis Using Subcritical Gas Adsorption Method. In *SPE Annual Technical Conference and Exhibition*. Society of Petroleum Engineers.

### Conference Expanded Abstracts

1. Murugesu, M. P. (2017, October). Pore Structure Analysis Using Subcritical Gas Adsorption Method. In *SPE Annual Technical Conference and Exhibition*. Society of Petroleum Engineers.

*The oil and gas industry has been tapping into tight reservoirs with low permeability and porosity. This calls for methods to enhance our understanding of tight reservoirs, such as shale. A large percentage of gas in place in shale reservoirs is in the form of adsorbed gas on the surfaces of pores. The pores of shale reservoirs range from micro-, meso- to macropores. Small pores contribute to large surface area accessible for adsorption, emphasizing the importance of studying pore structure in nanoscale. Subcritical gas adsorption is a useful method to characterize pore structures in nanoscale in terms of quantifying pore volume, determining the presence of micropores, predicting pore geometries and the accessible surface area for adsorption.*

*This paper discusses results obtained from running adsorption on samples of four different formations: Niobrara shale, Lokpanta oil shale, Hawaiian basaltic rock and Berea sandstone. Some of the results used to both qualitatively and quantitatively study pore structures are isotherm, pore size distribution and specific surface area. These results both affirm and debunk generalizations tied to certain formations. For instance, sandstone typically has large grains and this is confirmed by the zero micropores shown in both its isotherm and pore size distribution. On the contrary, some of the basaltic rocks are expected to have high specific surface area due to its high clay content, yet the samples showed low specific surface area instead. This informs the lack of information available on the sample, thus, initiating more tests to understand other factors that may be causing low specific surface area. Moreover, Lokpanta oil shale does not have any external information provided, but the isotherms and pore size distribution help to intuitively grasp the image of the samples' pore structures. This paper illustrates how best to analyze and compare the experimental results.*

*Subcritical gas adsorption makes it easy to picture pore structures at nanoscale. Understanding pore structures, specific surface area available for adsorption and micropore volume for storage purposes is crucial for applications, such as carbon capture and storage (CCS).*

2. Murugesu, M., Prasad, M. Rock Characterization through Gas Adsorption. Poster Presented at: Geological Society of America (GSA); Sept 2016; Denver, CO.

*This poster illustrates rock characterization of various types of rocks from different formations through subcritical gas adsorption. Results Obtained from Gas Adsorption:*

- Δ • Pore size distribution at nano-scale
- Δ • Isotherm
- Δ • Specific surface area
- Δ • Pore volume

Δ *Significance of Gas Adsorption*

- Δ • Quantification of pore structures
- Δ • Prediction of pore geometry
- Δ • Accessible surface area

- △ • *Storage properties of the rock*
- △ *The method of gas adsorption include 2 processes:*
- △ • *Degassing at vacuum condition & appropriate temperature*
- *Running analysis*

*Results:*

- △ • *Comparison of Isotherms from different lithology, such as Bakken, Hawaii Lava Rocks, Niobrara, Lokpanta Oilshale.*
- △ • *Powder samples give larger specific surface area (SSA) compared to pellets, but it is not the case for all formations.*
- △ • *The isotherms of Hawaii Lava rocks obtained from the two analyzing machines show similar patterns.*
- △ • *Higher clay content contributes to larger specific surface area.*
- △ • *Higher amount of organic matter contributes to lower specific surface area.*
- △ • *Clay materials and Berea sandstone act as standard material.*

Joewondo, N., Murugesu, M., Prasad, M. A systematic workflow in quantifying surface area and pore-size distribution using the nitrogen adsorption experiment. In *4th International Workshop of Rock Physics*.

*With increasing interests in shale reservoirs, the need for understanding nanopore structures of shales becomes crucial. Nitrogen adsorption method has been proven for its ability of the surface area (SSA) and pore-size distribution (PSD) analysis of micro- and mesopores. This paper integrates recent advancements in adsorption techniques described by the 2015 IUPAC publication, which are rarely discussed in the application of this technique on rock samples, to address some challenges: (i) Nitrogen gas has been widely used as the adsorptive for pore characterization, however, the fluid rock interaction due to quadrupole moment of nitrogen molecules is not accounted in the BET method for SSA inversion; (ii) the preferred method to inverse PSD, BJH technique, ignores pore geometry and its effect on pore confined thermodynamics; (iii) the inability of the classical methods to encompass the whole range of micro-mesopore scales. We present a systematic workflow, which integrates both classical and statistical thermodynamics based methods, to guide users in obtaining repeatable and justifiable results, particularly for the application on clay rich mudrock samples.*