

## Jury Member Report – Doctor of Philosophy thesis.

**Name of Candidate:** Ayomikun Bello Sunday

**PhD Program:** Petroleum Engineering

**Title of Thesis:** Co-optimization of the methods of oil recovery and CO2 storage using nonionic-based binary surfactant foams

**Supervisors:** Professor Alexey Cheremisin

**Co-supervisor:** Dr. Anastasia Ivanova

**Name of the Reviewer:** Boxin Ding

I confirm the absence of any conflict of interest	<b>Date: 07-11-2024</b>
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*The purpose of this report is to obtain an independent review from the members of PhD defense Jury before the thesis defense. The members of PhD defense Jury are asked to submit signed copy of the report at least 30 days prior the thesis defense. The Reviewers are asked to bring a copy of the completed report to the thesis defense and to discuss the contents of each report with each other before the thesis defense.*

*If the reviewers have any queries about the thesis which they wish to raise in advance, please contact the Chair of the Jury.*

### Reviewer's Report

Reviewers report should contain the following items:

- Brief evaluation of the thesis quality and overall structure of the dissertation.
- The relevance of the topic of dissertation work to its actual content
- The relevance of the methods used in the dissertation
- The scientific significance of the results obtained and their compliance with the international level and current state of the art
- The relevance of the obtained results to applications (if applicable)
- The quality of publications

The summary of issues to be addressed before/during the thesis defense

It's exciting to see that the numerical modeling and experimental works are combined into one piece of PhD thesis work. The candidate provides a comprehensive investigation on utilization of CO<sub>2</sub> foam for improved oil recovery and carbon sequestration. The candidate focuses on binary surfactant systems as foaming agents, to address the limitations of existing commercial surfactants: high rock adsorption, poor foamability and stability, incompatibility with harsh conditions, and high injection volumes leading to increased costs. This thesis presents a comprehensive multiscale study that investigates the development and characterization of these surfactant systems on a molecular scale through lab core scale up till their application in a reservoir scale geological model. The results shows that the CO<sub>2</sub> foam is promising in improved oil recovery and improvements of CO<sub>2</sub> storage in geological porous media. The candidate has published 7 papers (2 under review) forming part of the thesis, and 4 papers relevant to the thesis but not forming part of it. In addition the candidate has presented their results for ten times in conferences. Overall, the quality of the results are good and I recommend that the candidate should defend the thesis by means of a formal thesis defense.

#### **Provisional Recommendation**

*I recommend that the candidate should defend the thesis by means of a formal thesis defense*

*I recommend that the candidate should defend the thesis by means of a formal thesis defense only after appropriate changes would be introduced in candidate's thesis according to the recommendations of the present report*

*The thesis is not acceptable and I recommend that the candidate be exempt from the formal thesis defense*