Skoltech
Skolkovo Institute of Science and Technology

Jury Member Report – Doctor of Philosophy thesis.

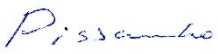
Name of Candidate: Lyudmila Khakimova

PhD Program: Petroleum Engineering

Title of Thesis: New approached for numerical modeling of air-injection based enhanced oil recovery

Supervisor: Associate Professor Alexey Cheremisin

Name of the Reviewer: Dimitri Pissarenko

I confirm the absence of any conflict of interest (Alternatively, Reviewer can formulate a possible conflict)	**Signature:**  **Date: 12-11-2020**

Reviewer's Report

The thesis manuscript submitted by Lyudmila Khakimova entitled "*New approached for numerical modeling of air-injection based enhanced oil recovery*" provides an account of an extensive and thoroughly conducted research on a highly relevant industrial topic of enhanced oil recovery (EOR). The presented thesis consists of two main parts dedicated to construction and validation of numerical models of hydrocarbon oxidation experiments, and to elaboration of new approach for simulation of multicomponent multiphase hydrocarbon mixtures. Both problems addressed in the thesis are of practical relevance for the design and laboratory validation of new EOR techniques based on air and gas injection. The first problem is principally solved using commercial numerical simulators, while the second one is explored with an original research code based on classical thermodynamics approach and optimization algorithm. The methodology of the presented research is based on constructing physically founded numerical models and on validating the results of the simulations by comparing them with specially designed laboratory tests and with the results obtained by industry standard procedures or on industry grade simulators. The results of the cross-validation between the original numerical models and the proprietary experimental data have a scientific significance, since many of the experiments were performed on a unique experimental base at Skoltech and provide a new insight into the capabilities and limitations of air injection based EOR technologies.

The presented manuscript is well structured and is written in clear and rigorous style in line with best international scientific writing standards. The candidate has published eight papers in major international and Russian scientific journals, and she has contributed to four scientific and industrial conference

presentations, which makes her fully compliant with respect to the formal requirements of Skoltech to a PhD candidate.

I confidently recommend the presented thesis for the defense.

Prof. Dimitri Pissarenko

Provisional Recommendation

V *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*