

Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Tatiana Bondarenko

PhD Program: Petroleum Engineering

Title of Thesis: Evaluation of high-pressure air injection potential for in-situ synthetic oil generation from oil shale: Bazhenov Formation


Supervisor: Prof. Alexey Cheremisin

Chair of PhD defense Jury: Prof. Alexei Buchachenko

Email: a.buchachenko@skoltech.ru

Date of Thesis Defense: December 03, 2018

Name of the Reviewer: S.M. Farouq Ali

<p>I confirm the absence of any conflict of interest</p> <p>(Alternatively, Reviewer can formulate a possible conflict)</p>	<p>Signature:</p>  <p>Date: 26-11-2018</p>
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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

The thesis “Evaluation of High-Pressure Air Injection for In-Situ Synthetic Oil Generation from Oil Shale: Bazhenov Formation” is acceptable in the present form. It is recommended that some of the changes suggested below be considered for enhancing the quality of this work.

The thesis is designed to evaluate the potential of HPAI for the oil shale of the Bazhenov Formation. Much basic work, such as DSC, TGA, RTO, etc., is done towards this end. Additional work provides the kinetic parameters for the key reactions leading to the formation of synthetic oil. This is high quality research, demanding great labor, and care in data interpretation. Most unique is thin section analysis giving a visual understanding of kerogen decomposition.

The four combustion tube experiments are not quite HPAI. These are really in situ combustion studies where shale samples are embedded in a porous pack, saturated with oil. It is not clear what was the porous medium nor what was the oil. The temperatures are much higher than those expected in HPAI. The results of the experiments (these and those mentioned previously) would depend on the grain size resulting from the crushed shale. There should be a discussion of these limitations. The question of whether it is possible to carry out HPAI in virgin shale with a permeability well below 1 mD remains unaddressed. If air injection can be achieved at a high enough rate, then the next question is what is the range of temperatures and whether these are high enough to generate synthetic oil, as seen in the basic studies (TGA, RTO, etc.).

The literature survey is quite comprehensive, but in several cases, second-hand papers are referred to instead of the original works. One of the key oil shale researchers (Kyung Jae Lee) is not mentioned at all.

I had the opportunity of seeing one of the publications by the author. The number of publications is impressive.

Overall, the thesis shows scholarship, originality, and an understanding of the processes taking place during in situ combustion in general. The objectives of the thesis are somewhat ambitious, considering the complexity of the process. I would like to see a paragraph entitled something like “Contributions to Knowledge”, which is the purpose of any Ph.D. thesis.

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