

Jury Member Report – Doctor of Philosophy thesis.


Name of Candidate: Daria Sergeeva

PhD Program: Petroleum Engineering

Title of Thesis: Development of thermodynamic models for phase equilibria of water-ice-gas-hydrate in aqueous solutions of inhibitors and in porous media

Supervisor: Principal Research Scientist Vladimir Istomin

Name of the Reviewer: Boris V. Balakin

<p>I confirm the absence of any conflict of interest</p> 	<p><i>Balakin</i> Date: 03-11-2021</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 describes the development of new formulations for phase equilibria of gas hydrates in systems involving porous media and different types of hydrate inhibitors. In addition to the development, the author applied the new formulations to several industrial cases specific to the Russian gas industry.

The results of the conducted study are of indubitably high industrial relevance as they propose a methodology leading to a significant spare of hydrate inhibitors. The proposed formulations are applicable in flow assurance. Altogether, the results are significant for offshore production systems where the logistical costs are highest. These indicate a high international relevance of the study.

The thesis is of high quality, well-structured and concise. The referee notes a very comprehensive and patriotic literature overview in the Introduction. Ten articles published in international scientific journals with peer review follow the dissertation. A significant part of the journals indexed by Scopus. Six conference contributions come in addition.

There are several comments that I recommend to be addressed in the final version of the thesis. They are listed below.

- * The novelty of the work is to be explicitly highlighted in the Abstract and the Conclusions.
- * Table 5.3. It is essential to mention the experimental method used to determine the particle size distribution.
- * An economical estimate that highlights the advantage of mixed inhibitors is to be provided.
- * "The water droplets with a characteristic radius of 50-100 microns move together with the gas flow". To elaborate on how the drop sizes were determined.
- * It is unclear how Eq.74 is derived. The author has to include a detailed description of the conducted thermal analysis.
- * The thesis is missing: a complete description of limitations of the developed models, a recommendation for further work.
- * There are typos and grammatical mistakes. I recommend proofreading the thesis by a native speaker or an AI-based software, f.e. Grammarly.
- * Figures should be in a vector format where possible.
- * The author used the plural "we" in many places of the work, which is supposed to be individual. To correct.
- * Figs.2.1-2.3. Does the author develop them? In another case, a reference to be provided
- * Fig.7.10 and similar. It is important to distinguish lines by their style rather than color.

Provisional Recommendation

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

