Skoltech
Skolkovo Institute of Science and Technology

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: Alexander SHANDRYGIN

I confirm the absence of any conflict of interest	**Date: 06-11-2021**

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

Reviewed thesis is devoted to fundamental problems of thermodynamic modeling of phase equilibria of water-ice-gas-hydrate in aqueous solutions of inhibitors and in porous media and development of practical methods for hydrates control in oil and gas industry on the basis of the obtained solutions. The dissertation work was carried out at a high scientific level. The structure of the thesis is well thought out, contains all the necessary chapters to describe the solution of the posed problems.

The content of the thesis is fully relevant to the title of the dissertation work.

The author of the thesis solves the considered problems using analytical methods of thermodynamic modeling of gas hydrate behavior and analysis of the currently available experimental data. For thermodynamic modeling the special hydrate software were used: VNIIGAZ- Istomin and Kwon's program, HydraFLASH (the Heriot-Watt University) and REFPROP (National Institute of Standards and Technology). I believe these programs are fully applicable for solution of posed problem. With aim of more reliable using of existing experimental information author proposed technique for checking thermodynamic

consistency and smoothing experimental data. Thus, the methods used in the dissertation work are relevant to the considered problems.

The obtained results seem to be important both in theoretical and practical terms for the development of research in the field of phase behavior of complex gas hydrate systems both in bulk conditions and porous media. They fully correspond to the world level and current state of the art of research carried out in this field of natural science.

Definitely, the results presented in thesis can be applicated for hydrate control on gas fields. Moreover, they have being already make it possible to optimize the technology for hydrate inhibition in the wellbores and gas-gathering systems of the gas-condensate fields of Eastern Siberia.

Author published results of her researches in leading the world and Russian journals including indexed in Scopus.

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*