REVIEW
of the official reviewer for dissertation work
BEKTASSOV MARAT AIDARULY on the theme «Development of comprehensive methods for organic compounds determination in water» presented for the degree of Doctor of Philosophy (PhD) in the specialty «Chemistry».

№	Criteria	Eligibility (one of the options must be checked)	Justification of the position of the official reviewer
1.	The topic of the thesis (as of the date of its approval) corresponds to the directions of development of science and/or state programs	1.1 Compliance with priority areas of science development or government programs:	/
		1) The thesis was completed within the framework of a project or target program financed from the state budget (indicate the name and number of the project or program) 2) The thesis was completed within the framework of another state program (indicate the name of the program) 3) The dissertation corresponds to the priority direction of the development of science, approved by the Higher Scientific and Technical Commission under the Government of the Republic of Kazakhstan (indicate the direction)	/
2.	Importance for science	The work **makes**/does not make a significant contribution to science, and its importance is well **disclosed**/not disclosed	The present thesis makes a significant contribution in the field of BVOC analysis from water samples. The importance of the research, as well as the global context, are well explained in Chapter 1 of the thesis. The present work developed a novel analytical workflow, using DHS-GC-MS technology, in order to analyze different BVOC. The work was splitted in different objectives. First, the development of DHS-GC-MS conditions for a mix of 5 representative BVOC. Next, the development of an analytical workflow specific to dimethyl

			sulfide (DMS). Finally, the DMS method was applied in a real case in the context of microalgae culture. All the analytical development were benchmarked to existing gold standard methods.
3.	The principle of independence	Self-reliance level: 1) **High**; 2) Medium; 3) Low; 4) No independence	The candidate self-reliance seems high with a thesis reflecting a good understanding of the theory behing the analytical methods and the context of the research.
4.	The principle of inner unity	4.1 Justification of the relevance of the thesis: 1) **Justified**; 2) Partially justified; 3) Not justified.	The relevance of the thesis is well justified in chapter 1.
		4.2 The content of the thesis reflects the topic of the thesis: 1) **Reflects**; 2) Partially reflects; 3) Does not reflect	The topic of the thesis developed in chapter 1 is in accordance with the content of the following chapters.
		4.3. The purpose and objectives correspond to the topic of the thesis: 1) **correspond**; 2) partially correspond; 3) do not correspond	The purpose and objectives correspond to the topic as described in chapter 1.
		4.4 All sections and provisions of the thesis are logically interconnected: **1) completely interconnected;** 2) the interconnection is partial; 3) there is no interconnection	All the sections are interconnected and linked to the thesis in a logical way. They follow the different part/papers conducted and generated during the research.
		4.5 The new solutions (principles, methods) proposed by the author are reasoned and evaluated in comparison with the known solutions: **1) there is a critical analysis;** 2) partial analysis;	All the analytical development were benchmarked to existing gold standard methods.

		3) the analysis does not represent one's own opinions, but quotes from other authors	
5.	Scientific novelty principle	5.1 Are the scientific results and provisions new? **1) completely new;** 2) partially new (25-75% are new); 3) not new (less than 25% are new)	The scientific results are new and the analytical developments are sounded and based on literature knowledge.
		5.2 Are the dissertation findings new? **1) completely new;** 2) partially new (25-75% are new); 3) not new (less than 25% are new)	To the best of my knowledge, the findings are new. They demonstrate the added value of DHS versus conventional P&T.
		5.3 Technical, technological, economic or management decisions are new and reasonable: **1) completely new;** 2) partially new (25-75% are new); 3) not new (less than 25% are new)	The technical and technological decisions are sounded and new. The candidate also took intro account the "green"dimension of the analytical methods.
6.	The validity of the main findings	All main conclusions **are**/are not based on scientifically significant evidence or well-grounded (for qualitative research and areas of training in the arts and humanities)	All the sections are conducted with robust analytical rigor. All the figure of merits characterizing the methods are described, allowing robust evaluation and comparison.
7.	The main provisions for the defense	It is necessary to answer the following questions for each provision separately: 7.1 Is the provition proven? 1) **proven**; 2) rather proven; 3) rather not proven; 4) not proven 7.2 Is it trivial? 1) yes; 2) **no** 7.3 Is it new? 1) **yes**; 2) no 7.4 Application level: 1) **narrow**;	**Provision 1: Dynamic headspace extraction coupled with gas chromatography-mass spectrometry for the determination of 2-pentanone, dibromomethane, α-pinene, Δ^3-carene, and nonanal in water samples.** The provision has been proven through the careful optimization of all the DHS steps and the comparison with other sampling conditions. The work conducted was robust and the results have been published in a top analytical journal.

		2) medium; 3) wide 7.5 Is it proven in the article? 1) **yes**; 2) no	The development methodology could have been simplified and more efficient through the implementation of design of experiment approach. Nevertheless, the output is solid.
		It is necessary to answer the following questions for each provision separately: 7.1 Is the provition proven? 1) **proven**; 2) rather proven; 3) rather not proven; 4) not proven 7.2 Is it trivial? 1) yes; 2) **no** 7.3 Is it new? 1) **yes**; 2) no 7.4 Application level: 1) **narrow**; 2) medium; 3) wide 7.5 Is it proven in the article? 1) **yes**; 2) no	**Provision 2: Indirect determination of dimethylsulfoniopropionate via its alkaline hydrolysis product, dimethyl sulfide, using dynamic headspace extraction coupled with gas chromatography-mass spectrometry in water samples** The provision has been proven through the development of a specific DHS-GC-MS workflow for DMS quantification. This section could have been push deeper by the investigation of additional sorbent materials, especially sulfure dedicated ones. The work is sounded and significant and the results are submitted for publication in a top analytical journal.
		It is necessary to answer the following questions for each provision separately: 7.1 Is the provition proven? 1) proven; 2) **rather proven;** 3) rather not proven; 4) not proven 7.2 Is it trivial? 1) yes; 2) **no**	**Provision 3: Determination of dimethylsulfoniopropionate via derivatization to dimethyl sulfide combined with optimized dynamic headspace extraction yields to an increase in analytical response relative to a static headspace-based method.** The provision has been proven through

		7.3 Is it new? 1) **yes**; 2) no 7.4 Application level: 1) **narrow**; 2) medium; 3) wide 7.5 Is it proven in the article? 1) **yes**; 2) no	the investigation of equilibrium between DMSP and DMS. Multiple parameters, such as pH, salt concentration, etc., have been investigated. The optimized DHS conditions have been compare to the reference HS methods.
8.	The principle of reliability Reliability of sources and information provided	8.1 Choice of methodology - is justified or the methodology is described in sufficient detail 1) **yes**; 2) no	Yes the method is sounded and well described
		8.2 The results of the thesis were obtained using modern methods of scientific research and methods of processing and interpreting data using computer technologies: 1) **yes**; 2) no	Yes the quantitative data were evaluated using state-of-the-art approaches.
		8.3 Theoretical conclusions, models, identified relationships and patterns have been proven and confirmed by experimental research (for areas of training in pedagogical sciences, the results have been proven on the basis of a pedagogical experiment): 1) **yes**; 2) no	Yes the conclusions are based on the obtained results and discut based on the existing knowledge in the literature.
		8.4 Important statements are **confirmed** / partially confirmed / not confirmed by references to current and reliable scientific literature	The literature seems up to date with the field.
		8.5 Used literature sources are **sufficient**/not sufficient for a literature review	The literature seems up to date with the field.
9	Practical value principle	9.1 The thesis has theoretical value: 1) yes;	This thesis discute the theory behind the analytical developments but there was

		2) **no**	no development on the theoretical side.
		9.2 The thesis is of practical importance and there is a high probability of applying the results obtained in practice: 1) **yes**; 2) no	Yes the thesis is providing new approaches for BVOC analysis in water samples.
		9.3 Are the practice suggestions new? 1) completely new; 2) **partially new (25-75% are new);** 3) not new (less than 25% are new)	The developed methodologies are new. They were build on existing knowledge in the field. The obtained results were expected, which does not descrease the significance of the work.
10.	The quality of writing and design	Academic writing quality: 1) **high**; 2) average; 3) below average; 4) low.	The thesis is clear and well written.
11.	Notes on a thesis		I do not have major comments regarding the present thesis. I have some recommendation which could be used as discussion starter during the defence. 1. The candidate is discussing the green aspects of the developed methods, but the context of green analytical chemistry is not developed. The AGREEprep results are presented but with no reel context. 2. In the same line, there is a strong push for using the White Chemistry on top of the Green Chemistry principles. This could be an interesting aspects to develop. 3. For all the development, the candidate used a one factor at

			the time development approarch. I believe that the introduction of DoE approach could facilitate the optimization of the sampling conditions, especially for interconnecter parameters, such as dry volume and dry temperature.
12.	Scientific level of the doctoral student's articles on the topic of research (in case of defense of the dissertation in the form of a series of articles, the official reviewers comment on the scientific level of each article of the doctoral student on the topic of research)		The main results of the present thesis have been published in two Q1 analytical journal, and a third one has been submitted. In addition, the work has been presented in, at least, one international conference with a published abstract.
13.	Decision of the official reviewer (pursuant to paragraph 28 of the present Model Regulations)		The thesis presented by BEKTASSOV MARAT AIDARULY is of high quality and well written. The volume and the quality of the work deserve to be rcognized through a PhD degree.

In reviews, official reviewers indicate one of the following solutions:

1) **to award the degree of Doctor of Philosophy (PhD);**

2) send the thesis for revision (except for cases of thesis defense in the form of a series of articles);

3) refuse to award the degree of Doctor of Philosophy (PhD).

Copies of the reviews of the official reviewers are handed over to the doctoral student no later than 5 (five) working days before the defense of the thesis.

Official Reviewer:

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