



27 March 2026

Foreign consultant's review of **Kalymbet Arailym**'s dissertation work on  
**“RESEARCH OF PROPERTIES AND DEVELOPMENT OF TECHNOLOGY FOR  
OBTAINING SORPTION-FILTERING MATERIALS FROM DOMESTIC RAW  
MATERIALS”**,

presented as part of the **dissertation defence for the Doctor of Philosophy degree** in the field of  
**“8D07109 - Innovative technologies and new inorganic materials”**

It has been a great pleasure and professional satisfaction to serve as a foreign scientific consultant for Ms. Kalymbet Arailym during her doctoral studies. Throughout the period of her PhD training, she demonstrated a very high level of commitment, responsibility, and perseverance. Despite the difficulties and challenges that arose during her work, she remained focused, motivated, and fully dedicated to the successful completion of her research.

Ms. Kalymbet Arailym's dissertation addresses a topic of clear scientific and practical importance. Her research is related to the development and investigation of silicophosphate sorbents synthesized through acid and thermal treatment of mining waste, and to the evaluation of their adsorption capacity for wastewater treatment applications. This topic is highly relevant due to the need for effective and economically feasible approaches for wastewater treatment, as well as the valorization of industrial and mining residues into useful functional materials, which aligns with the principles of the circular economy.

During the summer of 2023, Ms. Kalymbet Arailym visited the University of Chemical Technology and Metallurgy in Sofia, Bulgaria, where she conducted part of the planned experimental work on investigating the adsorption capacity of the synthesized sorbents. Throughout her stay, she left a strong impression on me with her organized, precise, and disciplined laboratory practice. Her work clearly demonstrated solid theoretical knowledge, excellent practical skills, and the ability to perform experimental tasks accurately and consistently.

I was also impressed by Ms. Arailym's personal and professional qualities. She is a highly responsible, reliable, and conscientious young researcher who can quickly understand and apply



new methods, concepts, and experimental approaches. She demonstrated a strong ability to adapt to new working conditions and effectively incorporated new knowledge into her research activities.

An additional strong indicator of the quality and importance of her doctoral work is the publication activity based on her experimental results. Our collaboration has already led to four joint publications, which demonstrate both the scientific value of the results and Ms. Arailym's active role in sharing them within the academic community.

In my opinion, Ms. Kalymbet Arailym has attained the scientific maturity, research competence, and academic level expected of a doctoral candidate. Her dissertation work includes original research results, demonstrates solid methodological preparation, and possesses both scientific merit and practical relevance.

Based on the quality of the dissertation, the results obtained, and my direct observations of her research and laboratory work, I strongly support Ms. Kalymbet Arailym's dissertation defense and recommend that she be awarded the degree of Doctor of Philosophy (PhD).

Sincerely, 

Assoc. Prof. Eng. Silviya Lavrova-Popova, PhD  
University of Chemical Technology and Metallurgy  
Sofia, Bulgaria