Supervisor's Review of a Master's thesis

Student's name and surname:	**Abdulkadir Bozarslan**
Degree programme:	Polymer Engineering N0722A130002
Degree course:	
Specialization (if the degree course is divided into specializations):	
Department:	Department of Polymer Engineering
Supervisor of the Master's thesis:	Ing. Michal Machovský, Ph.D.
Academic year:	2023/2024

Title of the Master's thesis:

Polymer Impregnated Adsorbents for Direct Air Capture

Assessment of the Master's thesis using the ECTS grading scale:

Assessment criteria	Assessment according to the ECTS
1. Topicality of the literature sources consulted	**A – Excellent**
2. Application of knowledge gained from literature	**A – Excellent**
3. Theoretical aspect dealt with in the thesis	**B – Very good**
4. Description of experiments and implementation methods	**B – Very good**
5. Level of quality of processing of the results	**A – Excellent**
6. Interpretation of the results achieved and discussion thereof	**B – Very good**
7. Formulation of the conclusion of the thesis	**B – Very good**
8. Student's approach to the Master's thesis	**A – Excellent**

Select the option the submitted thesis for defence and propose the following assessment:

B – Very good

Comments on the Master's thesis:

Master's thesis entitled "Polymer Impregnated Adsorbents for Direct Air Capture" submitted by Abdulkadir Bozarslan is dedicated to a leading innovative technology for stabilizing the CO_2 concentration in the atmosphere, providing an important tool for carbon management in net zero pathways. While the detailed effects of CO_2 on climate and environment are still under debate and controversy, it is undisputed that carbon dioxide is a greenhouse gas that could cause climate change. Regardless of the causes of the increasing concentration of CO_2, it is clear that without active measures leading to stabilization, but ideally a reduction of its emissions due to anthropogenic activity, global warming will lead to environmental changes for which we are not prepared. While collecting the CO_2 at concentrated sources without ever letting it enter the atmosphere is cost-advantageous, this approach is not available for the many diffuse sources of CO_2. Since DAC is independent of the source of emissions, it can potentially compensate for any emitted CO_2 by capturing an equal amount of CO_2 at a different location and time, thus ensure a smooth transition away from fossil fuels in the coming decades. Actually, start-up companies established only recently are growing rapidly and CO_2 captured directly from air has already been monetized

The master's thesis is 95 pages long and contains 51 figures, including 13 tables. Topic is well explored in the theoretical part, the author addresses the role of CO_2 in climate change and introduce the concept of DAC with emphasis on solid-state adsorbents, including design rules and principles. A whole chapter is devoted to amine functionalized solid-state adsorbents, yet another discuss specific amine-CO_2 interaction. Text is logically arranged, the language used is readable and also graphic is at high level. Author cite 62 thematically relevant and actual literature resources. At the end of literature survey on topic, goals of experimental are clearly defined.

The experimental part focused on functionalization of commercial calcium silicate support material using wide range of amine compounds. Set of samples was prepared by simple impregnation support material with branched polyethyleneimines of various molecular weight via high-speed shear mixing, while another set was obtained by aminosilanes grafting following classic wet route. After characterization by common instrumental techniques, performance of prepared solid adsorbents for CO_2 removal was evaluated by using thermogravimetry in a simulated flue gas atmosphere (10 % CO_2) as well as direct air capture simulated conditions (400 ppm CO_2). I would like to highlight the extent of experimental work carried out which exceeds by far common range. In spite, the methods description, results presentation and discussion is at high level.

In summary, the submitted master thesis meets all the requirements stated in the official assignment, set of goals for experimental part was fulfilled, it was submitted on time and passed the plagiarism check. I higly appreciated ability of the author to quickly absorb new topic and to work largely autonomously. Both theoretical and experimental part were processed independently by student and he also sucessfully adopted all characterization techniques used throughout experimental. So, despite some minor shortcomings, I recommend the submitted master's thesis of Abdulkadir Bozarslan for defense with the assessment B-very good

The Theses.cz system has detected percentage of similarity with other documents amounting to a maximum of 2 %.
It is an authentic **thesis.**

Questions to be asked by the Master's thesis supervisor:

In Zlin on **22. 05. 2024**

Signature of the Master's thesis supervisor