

Posudek doktorské práce

Uchazeč: **Musaddaq Azeem, M.Sc.**

Název práce: **Scientific Design of Multilayers Fog Collectors**

Pracoviště: **Textilní fakulta, Technická Univerzita v Liberci**

Oponent: **Petr Henyš, TUL, NTI**

Evaluation of the significance of the dissertation for the field

The thesis is devoted to a theoretical analysis of the influence of the structural properties of the fog collector on its efficiency and resulted in a modification that significantly increased the efficiency of current multilayer collectors. Furthermore, the reviewer appreciates the proposal of standardization of laboratory measurements, which is crucial for a repeatable comparison of newly designed and original collector types. Considering the topicality of the issue, the opponent considers the results of the work very satisfactory with the possibility of practical application in areas with low availability of domestic water.

Evaluation of the problem-solving process, the methods used and the achievement of the stated goal

In the first part of the thesis, the author summarizes the current state of knowledge and introduces the theoretical models that allow to determine the efficiency of the water harvesting process. In the design of the collector, the author adopts a combinatorial approach, sometimes without obvious explanation: for example, why did the author consider four different materials for the construction of the collector? The author has apparently built several collectors, but according to the opponent, he has not shown them sufficiently in the experimental part: for example, Figure 8 is a cut-out for which it is not clear where it is from and what the red circles mean. The same is true of the experimental setup in Figure 10. It is not clear whether the author designed and built this device himself or not. The choice of the appropriate material for the collector is slightly messy, as it is not clear what 'exact' properties the author has in mind and what literature he is referring to.

Opinion of the opponent on the original results of the author of the dissertation

The author has carried out an exhaustive number of experiments, including the preparation of his own laboratory equipment. However, the most important contribution of the author is the systematic design of a multilayer collector with increased wettability of the base material. Furthermore, the referee appreciates the author's confrontation of experimental results with theoretical models and their optimization.

Systematicity and formality of work and publications

From the formal point of view, the work does not deviate from the standard. In some places there is "ambiguous" information in the work, for example, see the note on the selection of a suitable material for the collector. Considering the number of experiments performed, the referee considers



that the thesis could contain more details and, for example, a suitable chart showing the structure and order of the experiments and their interconnection.

The author's original work has resulted in several publications in high quality journals, in particular the article in ACS Applied Materials & Interfaces is considered by the opponent to be very useful and clearly demonstrates the author's ability to conduct independent scientific research and to present results in a coherent form. Despite criticisms of some of the author's practices, which do not in any serious way call the author's work into question, the referee is convinced that Azeem Musaddaq is worthy of the degree of PhD.

V Liberci

Petr Henyš



Opponent Evaluation of Dissertation Thesis

Name of Thesis: Scientific Design of Multilayer Fog Collectors

Author: Musaddaq Azeem, M.Sc.

Evaluated by: Doc.Ing. Josef Dembický, PhD.

The submitted dissertation work is concerned with the proposal of fog collectors. It is focused on the multilayer collectors with optimized porosity of the collecting net. In the experimental part there are tested harp collectors. The aim of the thesis is to find an optimal design of collectors and on top an optimal surface properties of the collector element. There is compared the impact of hydrophilicity performed by plasma treatment and hydrophobicity performed by silicone treatment on the final efficiency of the collector. Based on experimental results the author proposes as optimal a collector with 4-5 layers and further the application of hydrophobic treatment on the polyethylen matrix based on silicone.

The thesis is written in english, it has got 78 pages with 7 main chapters and 28 subchapters. In the theoretical part there is included literature review and theory. The description is very detailed and well structured. In the experimental part there is described the research methodology, further the results and conclusion. The Author drew from 132 sources, he published 18 articles in the research journals in the time period 2017-2021, whereas 5 articles were focused on the topic of this dissertation. Further, he published 4 contributions in the international conferences in the time period 2017-2019. The author was 38x cited in research journals.

I have got these formal remarks to the thesis:

1. In the table of contents page ii chap. 3.3.2 is written in incorrect format
2. In the table of contents page iii the chap. „Wettability of Vertical Harps for Fog Collection“ is incorrect described as 5.2 (correct shall be 6.2)
3. Page 10 – incorrect described equation $LFC = \dots$
4. In the thesis the descriptions of parameters and units are sometimes confused described
5. Page 28 the last sentence there is incorrect mentioned the word „experimental“

6. Page 47 – incorrect mentioned the symbol in the description – Fig. (E) instead of Fig. (D)

I have got following questions to the author:

1. In chapter 6.1 there was determined that the optimal layer distance for the maximal water yield is 6 mm. How this fact can be explained?
2. Explain the term surface energy of materials. What values of surface energy do correspond to the tested material polyethylen and how do these values differ from the energies of materials which were in the study also considered to be used?

In the end I state that the dissertation thesis fulfills the specified criteria and I recommend it to the defense.

In Frýdlant, 12.1.2022

A handwritten signature in blue ink, appearing to read 'Josef Dembický', is written over a horizontal dashed line.

Doc. Ing. Josef Dembický, PhD.