

Reviewer's Dissertation Thesis Report

Author: Muhammad Yasir, M.Sc.

Dissertation Thesis Title: Nanofibrous Polymer Systems for Elimination of Estrogenic Hormones from Wastewater

Doctoral study programme: P3924 Material Sciences and Engineering

Student's workplace: Centre of Polymer Systems, Tomas Bata University in Zlin

Reviewer: Assoc. Prof. Adriana Kovalcik, Ph.D.

Report

The work aimed to develop a highly adsorbent material used for water purification from estrogenic hormone residues to improve the adsorption and desorption phases' efficiency and subsequent reuse of the adsorbent material. The adsorption materials investigated were nanofibrous polymer systems, including the following hydrophilic and hydrophobic polymers: polyurethanes, PA, CA, PSU, PES, PLA, PAN, and PVDF. This work is not only about developing suitable modification procedures for the preparation of electrospun polymeric nanofiber membranes with the highest possible adsorption capacity but also about developing a method for the detection and quantification of four estrogenic hormones simultaneously by HPLC technique using a UV-VIS detector. The topic of the dissertation is very actual and focuses on the problem of estrogenic hormones in surface and waste waters. In recent years, the possible presence of estrogenic hormones in water has raised concerns due to their impact on living organisms, including humans.

The dissertation is written on 160 pages and cites 190 references. Formally, the dissertation meets the usual expectations in terms of the structure and formal content of the chapters. Among the documents attached to the dissertation are four key-scientific articles of which the candidate is the first author. In addition, four other scientific articles published in impact journals and five articles published at international conferences in which the candidate is an author or co-author were listed in the dissertation. The CV of the dissertation's author highlights the candidate's high involvement in several scientific projects and two months of scientific work abroad, namely at the Leibnitz Institute of Surface Engineering in Germany. All this obtained expertise contributed to the excellent level of the dissertation. The dissertation topic, experimental processing and obtained results and discussion follow the current state of the art, and some of the suggested methods and scientific discussions are of top quality.

The focus, the dissertation's scope, and the objectives are well chosen experimentally. They are defined in 14 points. All the objectives have been fulfilled. Overall, the thesis was demanding, requiring perfect theoretical and experimental preparation. The obtained results have been published in impacted journals. It should be emphasized that the work was well prepared methodologically, and the methods were used effectively. The applied methodology corresponds to the work's focus and the workplace's experimental possibilities; this is great. I also appreciate the many precise figures and diagrams in the thesis, which the author either found in the literature or created himself. The conclusions provided in the thesis are logical and based on the results published in the articles. In addition, two chapters have been added regarding contribution to science, practice, and future plans.

Comments:

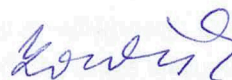
I find it confusing to include the author's experimental notes, conditions, and data in the theoretical part of the thesis (e.g., 2.3.1). The theoretical part of the thesis should include the findings of other authors.

Questions to the discussion:

1. In terms of the applicability of the nanofibrous polymer systems studied, I would like to know how many adsorption and desorption cycles can handle these materials and what was the adsorption limit, which was already considered insufficient. Which polymers and modifications were the most effective in the adsorption and desorption of estrogenic hormones?
2. Can the proposed electrospun polymer membranes be used for continuous water purification? What would be the limitations and constraints for such use?
3. The author notes that the highest solubility of estrogenic hormone was in the mixture of ethanol and water (20:80). However, in the case that hormones were first dissolved in water and later in ethanol, the solubility was only partial. Is it possible, despite the resulting lower solubility of hormones, to capture these hormones with prepared electrospun membranes? What are the limitations here, and how could they be addressed?

In conclusion, the submitted dissertation is prepared at a high professional level. The dissertation of Muhammad Yasir, M.Sc., meets the requirements for dissertations according to Section 47, paragraph 4, of Act No. 111/1998 Coll. on Higher Education in the Czech Republic. In my opinion, the thesis by Muhammad Yasir, M.Sc., fulfils all requirements for obtaining the Ph.D. degree. I am recommending the dissertation thesis for defence.

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