אוניברסיטת בר־אילן
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פרופ' יצחק מסתאי
המחלקה לכימיה אוניברסיטת בר אילן
רמת גן ישראל

Tuesday, 11 March 2025

Review Letter for PhD Dissertation of Rakhym Akmaral Bakhytzhankyzy

Dear PhD Committee,

I am pleased to provide my review of the PhD dissertation titled ***"Sorbents Based on Aluminosilicate Raw Materials for Heavy Metal Ions, Bisphenol-A, and Propranolol Extraction from Aqueous Solutions"*** by Akmaral Bakhytzhankyzy, whom I have had the privilege of supervising. This dissertation represents a comprehensive and well-executed investigation into the development of novel sorbents for environmental remediation. Akmaral has demonstrated a high level of academic rigor, technical competence, and independent research ability throughout this study.

Her research focuses on the development of efficient sorbents derived from aluminosilicate materials—zeolite (Z) and chamotte clay (C)—modified with surfactants (SLES and DDAB). These modified materials were tested for the removal of heavy metal ions, bisphenol-A (BPA), and propranolol (PRO) from aqueous solutions. The study systematically optimizes sorption conditions and explores the thermodynamics and kinetics of adsorption, contributing valuable insights to the field of water purification and environmental science.

The dissertation is well-structured, demonstrating a strong grasp of existing research and integrating relevant studies to build a solid theoretical framework. The literature review effectively justifies the research questions, and the experimental work is meticulously designed. Results are presented clearly and logically, supported by well-organized tables, figures, and charts. The analysis is thorough, and the interpretations are well-reasoned and substantiated by experimental data.

The dissertation presents novel contributions, including:

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- **First-time synthesis** of zeolite (Z) and chamotte clay (C) sorbents modified with anionic (SLES) and cationic (DDAB) surfactants.
- **Innovative modification techniques**, incorporating acid and salt treatments to enhance sorption properties.
- **Development of a new method** to evaluate the contributions of physical adsorption and ion exchange in sorption mechanisms.
- **First-time analysis** of interaction mechanisms between surfactants, aluminosilicates, and pollutants (heavy metals, BPA, PRO).
- **Discovery of optimal adsorption conditions** for lead (II) on chamotte clay, primarily through ion exchange.

Akmaral's research approach is thorough and well-documented. The experimental methods are robust, reproducible, and align with current standards in the field. The study employs advanced analytical techniques to evaluate the physicochemical properties of the sorbents and their interaction with pollutants, ensuring reliability and validity in the results.

Overall, this dissertation is an outstanding contribution to the field of environmental chemistry and materials science. The research is original, methodologically sound, and has significant practical implications for water purification technologies. I recommend the dissertation for defense and the candidacy of Rakhym Akmaral for awarding the PhD degree in the specialty 6D060600 - Chemistry.

I fully support the candidate's progression to the next stage of the PhD process and look forward to seeing the final version of the thesis after the necessary revisions.

Sincerely,

Prof. Yitzhak Mastai

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