Review from a scientific consultant on Kunarbekova Makhabbat Seit-Zadayevna's dissertation work on the topic "Preparation of modified carbon materials for the removal of radionuclides from contaminated water," submitted for the degree of Doctor of Philosophy (PhD) in the specialty "8D07109 - Innovative technologies and new inorganic materials."

Review

Modified carbon materials have garnered significant attention due to their effectiveness in environmental remediation, particularly for the removal of hazardous radionuclides from contaminated water. Given the substantial global challenges posed by radioactive pollution, especially in regions with historical nuclear activities, the development of efficient and sustainable adsorbents is both highly relevant and urgently needed. The doctoral dissertation presented by Makhabbat Seit-Zadayevna Kunarbekova addresses this critical area with substantial scientific rigor and innovation.

I am pleased to highlight the significant scientific contributions made by Makhabbat Seit-Zadayevna through her published research, including three articles in high-ranking international journals, a notable book chapter, and a registered patent. These works underscore her significant role and expertise in the synthesis and characterization of activated carbon materials derived from various biomass sources, such as rice husks, walnut shells, and buckwheat husks. Her methodological advancements involving chemical activation using potassium hydroxide and functionalization via nitrogen doping and ferrocyanide impregnation have substantially enhanced the adsorption capacities for radionuclides, particularly iodine and cesium.

The dissertation demonstrates comprehensive and meticulous use of advanced analytical methods, including BET surface area analysis, Raman spectroscopy, FTIR spectroscopy, scanning electron microscopy (SEM/EDX), zeta potential measurements, CHNS elemental analysis, and adsorption isotherm modeling. These detailed characterizations provided critical insights into the structural and functional properties that underpin the exceptional performance of the developed materials.

Furthermore, Kunarbekova has validated the effectiveness of her materials under realistic conditions, using samples from the National Nuclear Center of Kazakhstan, thus ensuring the practical relevance and applicability of her research outcomes. Her systematic approach and thorough exploration of the interactions between modified carbons and radionuclides have significantly advanced our understanding of adsorption mechanisms.

In summary, the dissertation by Makhabbat Seit-Zadayevna Kunarbekova represents a significant scientific achievement. Her innovative contributions to the field of material science and environmental remediation reflect both her high level of technical expertise and her dedication to impactful research. I am confident that her continued scientific endeavors will yield further valuable advancements in the domain of radionuclide remediation technologies.

Supervisor. PhD. Professor
Head of the Laboratory of Engineering Profile
Satbayev university

Azat S.