



TEXAS TECH UNIVERSITY

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RESPONSE LETTER

Regarding the dissertation of Ayatzhan Akhmetzhan «Synthesis of high water absorbent hydrogels and investigation of their physicochemical properties» presented for the degree of Doctor of Philosophy (PhD) in the specialty of 6D060600 – Chemistry.

In recent years, hydrogels have received broad interest due their unique properties, such as elasticity and swelling. Furthermore, the low cost hydrogels with porous structure becomes a promising candidate for water remediation due to their three-dimensional cross-linked structure, which can swell in water and trap the solute materials. Therefore, hydrogels have been used in many areas including medicine, agriculture, water purification etc.

Among them, poly(acrylamide)-based hydrogel has been widely applied in heavy metal removal because of cost-effectiveness and low pH sensitivity. The sorption mechanism of poly(acrylamide)-based hydrogels mainly depends on the hydrogen bonding and ion dipole attraction of amine groups. Therefore, to increase the heavy metal sorption of poly(acrylamide)-based hydrogels, it is required to modify or redesign the polymers.

Thus, in his work, Ayatzhan Akhmetzhan aims to synthesize copolymers of N,N-dimethylacrylamide with 2-acrylamido-2-methylpropanesulfonic acid and develop their cross-linked hydrogels.

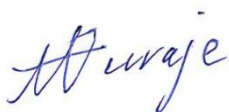
Mr. Akhmetzhan studied the copolymerization of the above monomers by changing various parameters such as initial concentration of monomers, temperature, initiator dose, and time. Furthermore, His research on the kinetics of copolymerization of monomers helped to understand fundamental of hydrogel formation. The reactivity of monomers is important parameter to control the architecture and composition of the copolymers which potentially lead to the high water absorbent hydrogel. Therefore, the kinetics of copolymerization is important step to optimize the process in large scale of production.

One of his important results obtained was the finding of the highest conversion point. Another important finding attained was the correlation of cross-linker concentration and pH with the swelling degree of the copolymers.

Additionally, he also studied the adsorption behavior of Pb(II) ions in the above hydrogel he synthesized.

As a result of his study, he published two research articles and one review article: First research article published in *Polymers for Advanced Technologies* (Q1 in SCOPUS, 5.4 (Cite score 2021), IF=3.67); second research article published in *Polymers* (Q1 in SCOPUS, 4.7 (Cite score 2021), IF=4.32); the review article published in *Gels* (Q2 in SCOPUS, Cite score 2021 is 4.1, IF=4.7). All three journals are indexed in both SCOPUS and WOS. In addition, he also published two research articles in domestic journals.

In all, Mr. Ayatzhan Akhmetzhan has conducted high level of scientific research works. The major results of his works are published in the peer-reviewed journals. His research works meet the requirements for PhD theses. As co-advisor of him, I strongly support him to be awarded the degree of Doctor of Philosophy (PhD) in the specialty of 6D060600 –Chemistry and Ayatzhan deserves the degree.



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