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pH AND CONDUCTIVITY CHANGE DURING THE RINSING AND ADSORPTION OF COPPER IONS ONTO WALNUT SHELLS

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ABSTRACT

The change in pH and conductivity values during the rinsing of the walnut shells as well as during the adsorption of copper ions was investigated in this study. The pH value increases during the rinsing of the adsorbent, reaching a constant value after the passing of 100 ml of distilled water. The increase in the pH value during the rinsing of the adsorbent occurs as a result of the transfer of H+ ions from the aqueous phase into the molecular structure of the adsorbent, where they are exchanged with alkali and alkaline-earth metal ions. As for conductivity change, a sudden increase in conductivity occurs after passing the first 50 ml of distilled water, followed by a decrease in conductivity with further rinsing. The increase in conductivity is most likely caused by the increase in the concentration of alkali and alkaline earth metal ions in the solution, which are being transferred from the adsorbent structure into the aqueous phase. During the adsorption process, the pH value rapidly increases for the first few minutes, after which starts to decline. The release of H+ ions from the adsorbent structure into the aqueous phase causes a rapid decrease in pH value as a result of the deprotonation of functional groups in the adsorbent molecular structure. The conductivity increases during the adsorption process. This increase is due to an increase in the concentration of alkali and alkaline earth metal ions in the solution, which are exchanged with copper ions during the adsorption process.

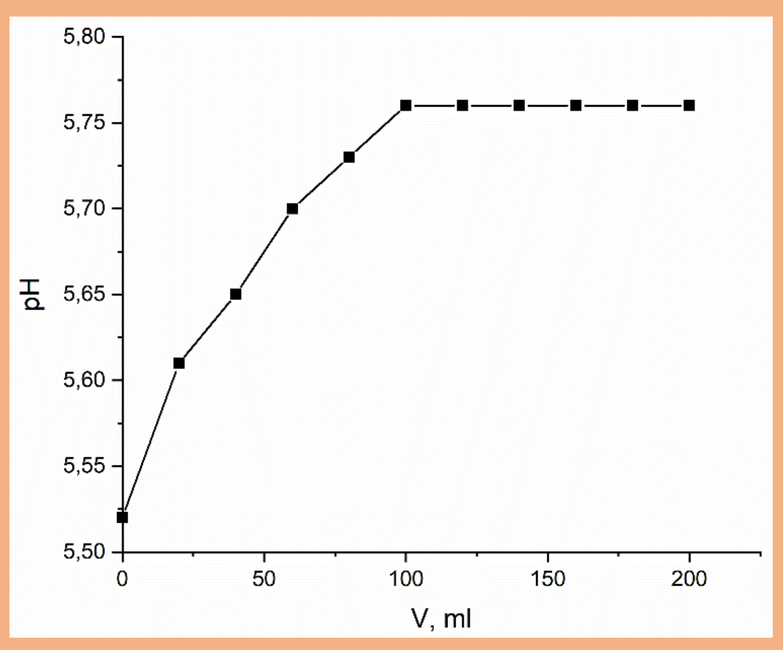

Figure 1. Change in pH value of the solution during the rinsing of the walnut shells

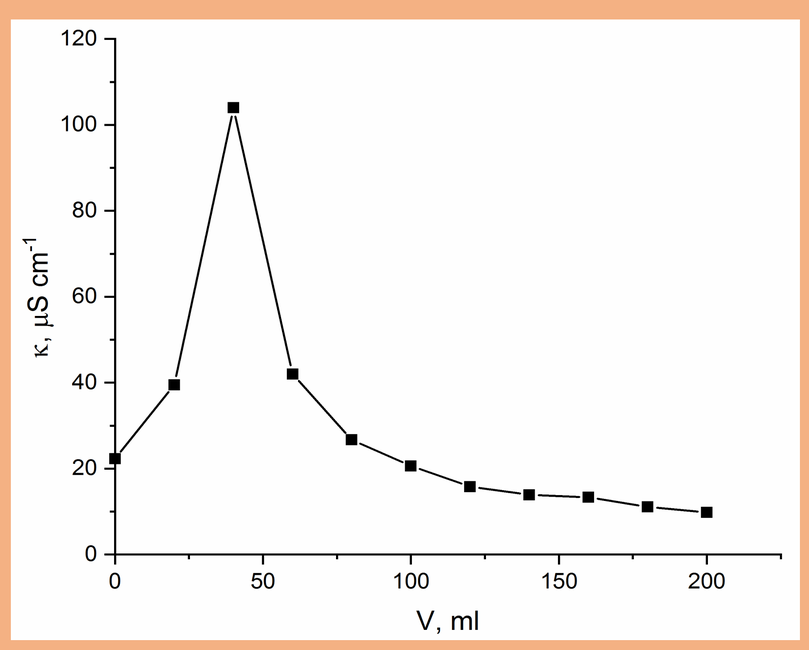

Figure 3. Change in pH value of the solution during the adsorption of copper ions onto walnut shells

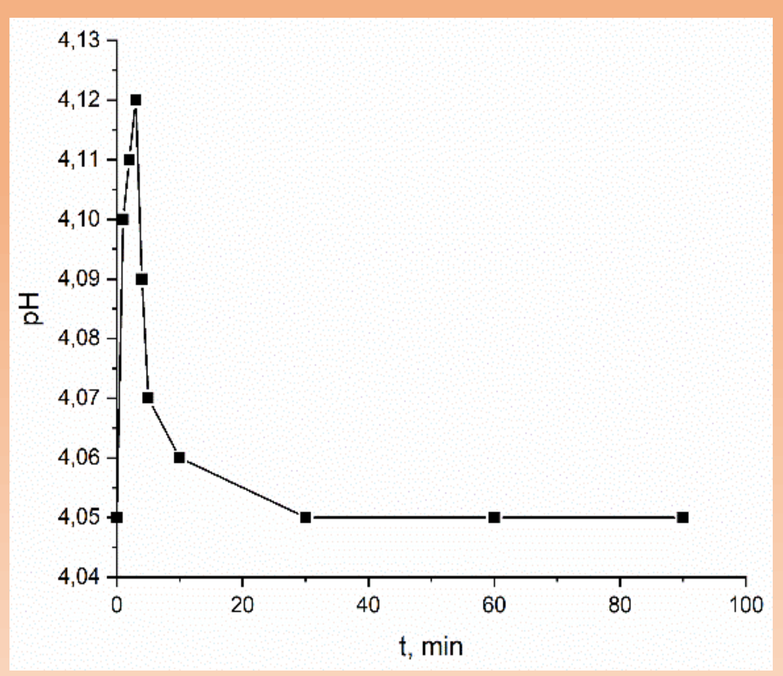

Figure 2. Change in conductivity of the solution during the rinsing of walnut shells with distilled water

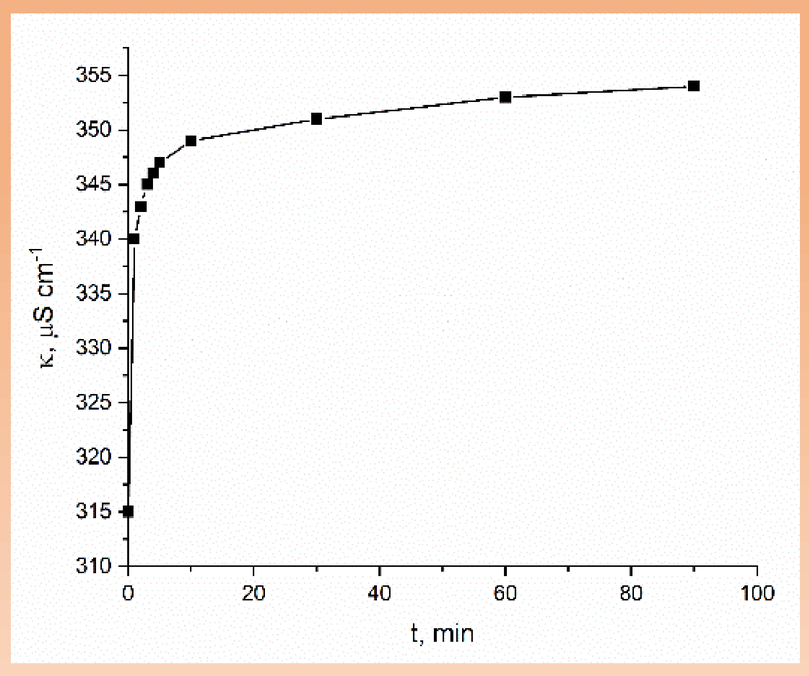

Figure 4. Change in conductivity of the solution during the adsorption of copper ions onto walnut shells

CONCLUSION

During the rinsing of the adsorbent, the pH value of the solution increases due to the transfer of H+ ions from the aqueous phase into the structure of the walnut shells. The conductivity of the solution first rises up to around 50 ml of distilled water passed, where it reaches its maximum value. After that, with further rinsing, a decrease in the conductivity of the solution is noted. The increase in the conductivity occurs due to the increase in the concentration of alkali and alkaline earth metal ions in the solution, which are transferred from the walnut shells structure to the aqueous phase. For the adsorption experiments, the pH value sharply increases in the first few minutes of the process, after which decreases, reaching almost a constant value after 30 minutes of the adsorption process. The decrease in pH value occurs due to the deprotonation of functional groups existing in the structure of the walnut shells, and the transfer of H+ ions into the solution, where they are exchanged with copper ions. The conductivity of the solution increases during the adsorption process. This increase occurs due to the increase in the concentration of alkali and alkaline earth metal ions in the solution, which are being exchanged with copper ions during the adsorption process.

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