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# HEAVY METALS REMOVAL FROM AQUEOUS SOLUTIONS AND WASTEWATERS BY USING VARIOUS BY PRODUCTS

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## ABSTRACT

Water contamination with heavy metals (HM) represents a potential threat to humans, animals and plants, and thus removal of these metals from contaminated waters has received increasing attention. The present study aimed to assess the efficiency of some low cost sorbents i.e., chitosan (CH), egg shell (ES), humate potassium (HK), and sugar beet factory lime (SBFL) for removal of cadmium (Cd), copper (Cu), lead (Pb) and zinc (Zn) from wastewaters. For this purpose batch equilibrium experiments were conducted with aqueous solutions containing various concentrations of the metalsm and sorbents in a mono-metal and competitive sorption system. Sorption isotherms were developed, and sorption parameters were determined. The potential applicability of the tested sorbents in the removal of Cd, Cu, and Zn from contaminated wastewaters was also investigated by equilibrating different sorbents and water ratios. Chitosan expressed the highest affinity for the metals followed by SBFL, ES, and HK. Nearly 100% of the metals were removed from aqueous solutions with the lowest initial metal concentrations by the sorbents especially CH and SBFL. However, the sorption efficiency decreased as the initial metal concentrations increased. Competition among the four metals changed significantly their distribution coefficient (Kd) values with the sorbents. The selectivity sequence of the metals was: Pb > Cu > Zn > Cd. The metal removal from the wastewaters varied from 72, 69, and 60 to nearly 100% for Cd, Cu and Zn, respectively. The efficiency of the studied byproducts in removing metals from the wastewaters differed based on the source of contamination and metal concentrations. Cadmium removal percentages by HK and CH were higher than SBFL and ES. The HK and CH exhibited the highest removal percentage of Cu from water with high concentrations. The SBFL and ES revealed the highest removal percentage of Zn from water with high concentrations. The result , demonstrate a high potential of CH, SBFL, HK, and ES for the remediation of HM contaminated astewaters