

## Design and Synthesis of Copper-Zeolite Composite for Antimicrobial Activity and Heavy Metal Removal From Waste Water

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**Abstract :** Background: The existence of heavy metals and coliform bacteria contaminants in aquatic system of Akaki river basin, a sub city of Addis Ababa, Ethiopia has become a public concern as human population increases and land development continues. Hence, it is the right time to design treatment technologies that can handle multiple pollutants. Results: In this study, we prepared a synthetic zeolites and copper doped zeolite composite adsorbents as cost effective and simple approach to simultaneously remove heavy metals and total coliforms from wastewater of Akaki river. The synthesized copper-zeolite X composite was obtained by ion exchange method of copper ions into zeolites frameworks. Iodine test, XRD, FTIR and autosorb IQ automated gas sorption analyzer were used to characterize the adsorbents. The mean concentrations of Cd, Cr, and Pb in untreated sample were 0.795, 0.654 and 0.7025 mg/L respectively. These concentrations decreased to Cd (0.005 mg/L), Cr (0.052 mg/L) and Pb (below detection limit, BDL) for sample treated with bare zeolite X while a further decrease in concentration of Cd (0.005 mg/L), Cr (BDL) and Pb (BDL) was observed for the sample treated with copper-zeolite composite. Zeolite X and copper-modified zeolite X showed complete elimination of total coliforms after 90 and 50 min contact time respectively. Conclusion: The results obtained in this study showed high antimicrobial disinfection and heavy metal removal efficiencies of the synthesized adsorbents. Furthermore, these sorbents are efficient in significantly reducing physical parameters such as electrical conductivity, turbidity, BOD and COD.

**Keywords :** WASTE WATER, COPPER DOPED ZEOITE X, ADSORPTION, HEAVY METAL, DISINFECTION, AKAKI RIVER

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