

## REMOVAL OF HEAVY METALS FROM DOMESTIC WASTE WATER USING KAOLIN CLAY FROM KUTIGI, NIGER STATE, NIGERIA

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**Abstract.** This study describes adsorption capacity of purified kaolin clay (PKC) from Kutigi, Niger State, Nigeria. This become necessary due health hazards caused by exposure of heavy metals contaminants in wastewater that have effect on both human and animal. Increased discharges of untreated sewage, combined with agricultural runoff, little or nonexistence of wastewater treatment at household in removing heavy metals like; total iron, cadmium, lead, copper, manganese, arsenic, mercury silver and zinc from domestic wastewater. Standard method of wastewater examination was used. Effects of the temperature, contact time, and adsorbent dosage of the removal process were investigated. Langmuir and Freundlich isotherms were applied to experimental data and the goodness of their fit for adsorption was compared. Enthalpy ( $\Delta H$ ), Gibb's free energy ( $\Delta G$ ) and entropy of adsorptions ( $\Delta S$ ) were done to assess the spontaneity of the system and to ascertain the exothermic or endothermic nature of the treatment process. The results show that the adsorption of total iron, cadmium, lead, copper, manganese, arsenic, mercury silver and zinc onto PKC follows Langmuir and Freundlich isotherm models. The values of  $\Delta H^\circ$  and  $\Delta S^\circ$  were found to be positive while  $\Delta G$  was negative. The positive value of  $\Delta H^\circ$  and  $\Delta S^\circ$  showed that the adsorption processes were endothermic in nature while the negative values of  $\Delta G^\circ$  indicated the adsorption of total iron, cadmium, lead, copper, manganese, arsenic, mercury silver and zinc onto PKC adsorbent was spontaneous and exothermic over the study range of tested temperatures. This showed that the adsorptive removal of total iron, cadmium, lead, copper, manganese, arsenic, mercury silver and zinc from domestic wastewater is very possible using rapid adsorption rates obtained between the contact times of 10 - 40 minutes.

**Keywords:** , Kaolin, Clay, Heavy Metal, Adsorptive, Isotherms, Freundlich