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REMOVAL OF ORGANIC DYES BY ADSORPTION FROM SYNTHETIC WASTEWATER BY ZINC BASED LDH

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INTRODUCTION

The water pollution from dyes industries is a major environmental problem. In the process of dye removal, many treatment methods such as chemical precipitation, membrane filtration , ion exchange , adsorption, photocatalysis and electrochemical degradation process were used [1] .

Among these, the adsorption technique using low cost adsorbents is considered as the most economical and effective method for removal of dyes.

The layered double hydroxides (LDHs) materials are considered to be a very efficient in the adsorption removal of dyes molecules. These LDHs materials can be formulated as, $[M1–x^{2+} Mx^{3+} (OH)_2]^{x+} (A^{n–}) x/n·mH_2O$, where M^{2+} is divalent (Mg^{2+}) and M^{3+} is trivalent (Al^{3+}) metal cations, $A^{n–}$ is inter-layer exchangeable anions such as $NO_3^–$,and m is amount of water molecules [2].

Recently, some articles have been published for multicomponent dyes adsorption systems on different adsorbents like the simultaneous removal of dyes from textile effluent [3].

The objectives of this work are as follows:

(i) The synthesis and characterization of Zn_2Al-LDH material.

(ii) The use of this material in the adsorption of dyes mixture released in wastewater (Indigo carmine and Congo red).

In this study,. different adsorption models were applied to the experimental data to analyze the adsorption process for single and binary solutions.

RESULTS AND DISCUSSION

CHARCTERIZATION

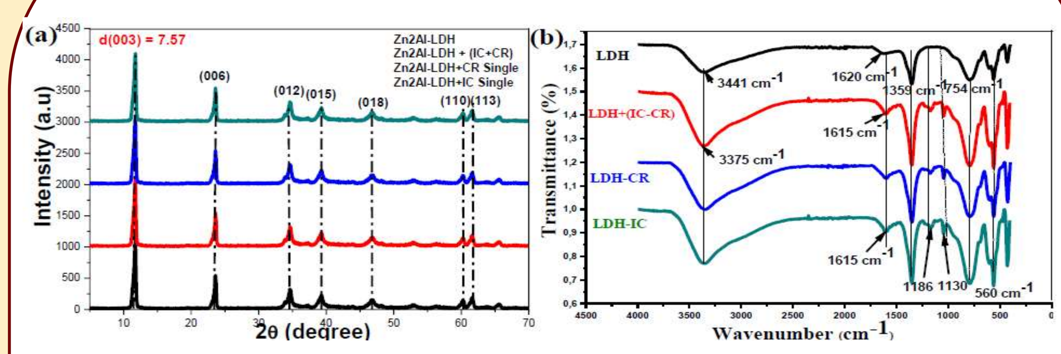

Figure 1 :XRD and IR analysis

Table 1 : LDH Parameters .

	a (Å)	c (Å)	d (Å)	BET surface m²/g
LDH	3,0	22.7	7,5	185,5

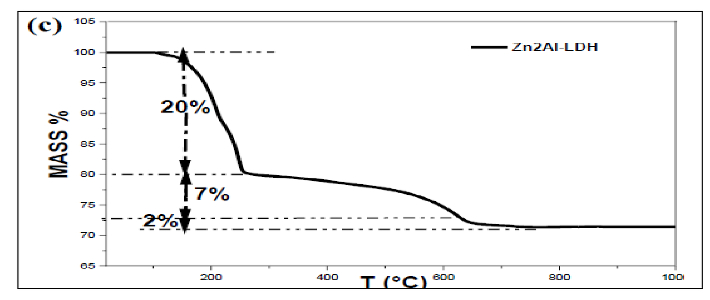

Figure 3 : ATG of the adsorbent

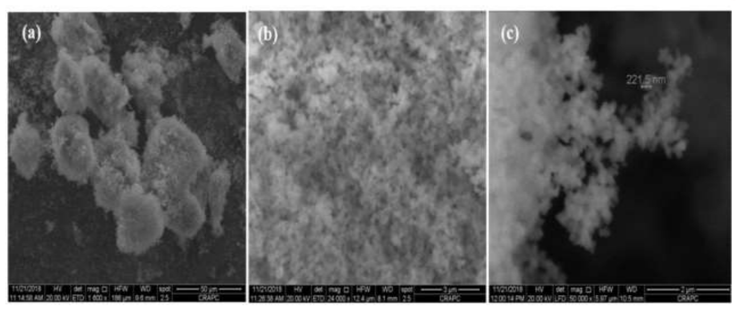

Figure 4 :SEM of LDH

APPLICATION

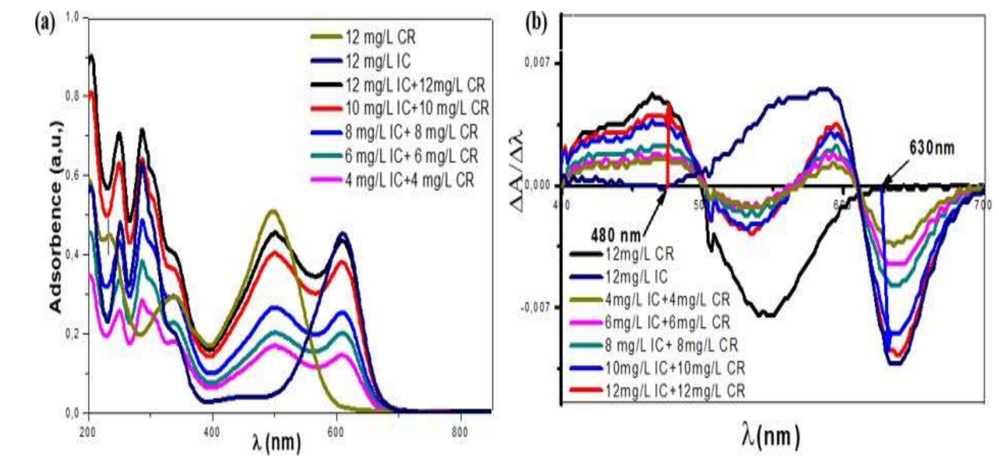

Figure 5 :a) Zero order spectra of dyes b) First order derivative spectra of dyes

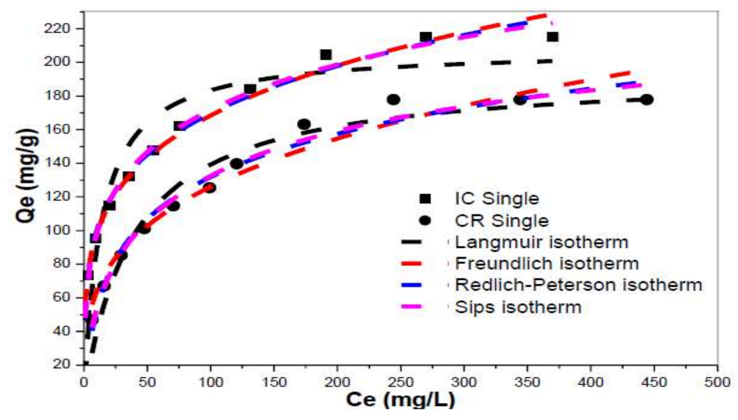

Figure 6 : Adsorption data analysis in single system with different isotherms.

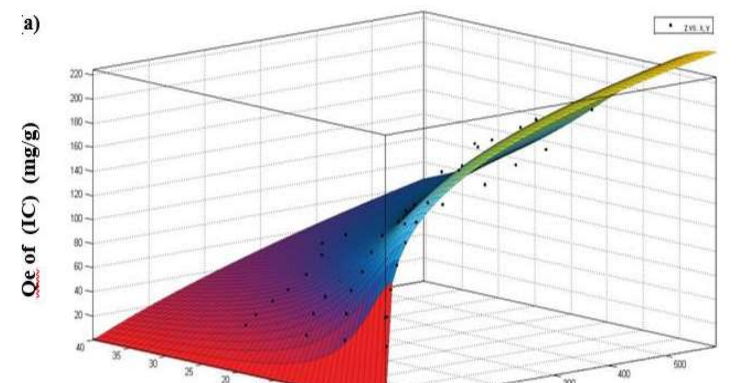

Figure 7 : Adsorption data analysis in binary IC/CR system with Sips .

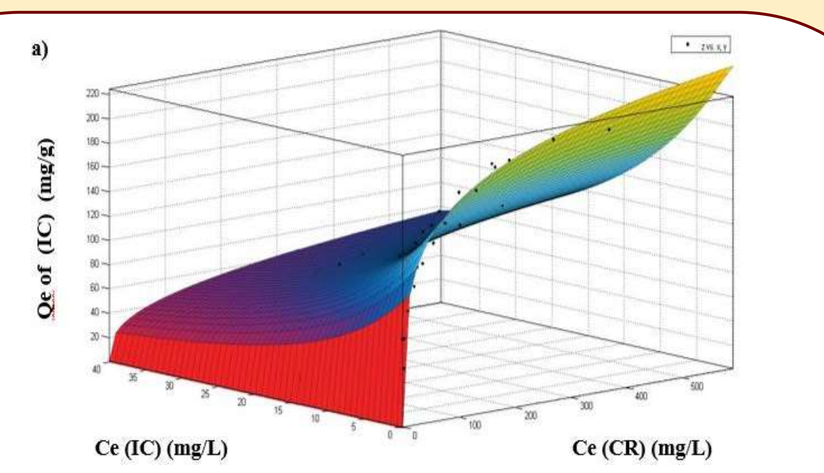

Figure 8 : Adsorption data analysis in binary IC/CR system with MRP.

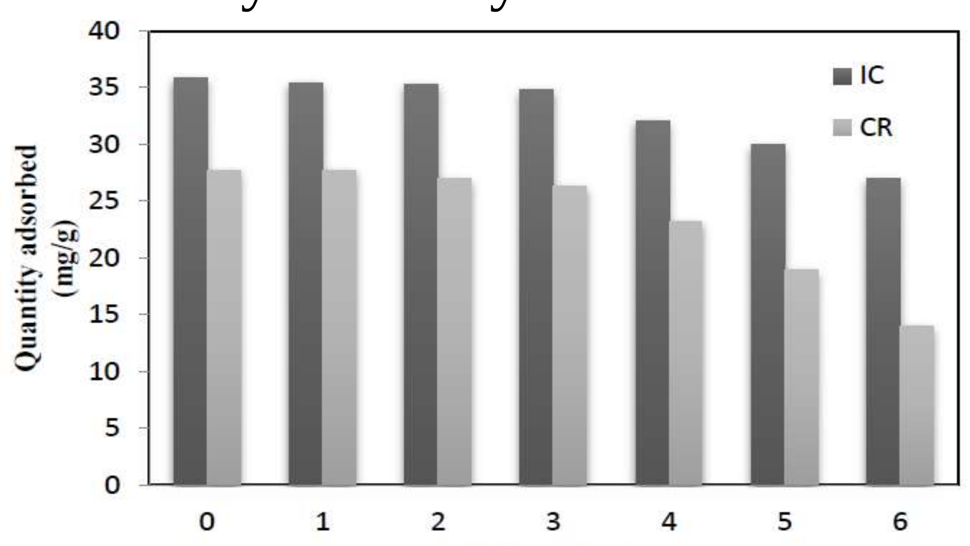

Figure 9: Adsorption capacity after 6 cycles

CONCLUSIONS

- High adsorption capacity of the LDH in a wide range of pH from 2 to 9.5
- The adsorption process is spontaneous and endothermic
- The experimental data n both systems , fit well with the second-order kinetic model.
- The experimental data in binary system are well fitted with EF, MRP, and Sips isotherm models.
- The adsorption process was dominated by electrostatic interactions and the dyes were not intercalated between the layers
- The adsorption capacity of the LDH reduced progressively during the sixth adsorption-desorption cycles.

REFERENCES

[1] P. Kumar, R. Agnihotri, K.L. Wasewar, H. Usluc, C. Yo, Desal. Wat.Treat **2012,**50,226-244.
[2]. Y. Huang , C. Liu , S. Rad , H. He , L. Qi , Processes **2022**,10, 617.
[3] A.A.Oladipo,M.Gazi, E.Yilmaz , Chem.Eng.Res.Des, **2015**,104 ,264–279.