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BINARY DYES ADSORPTION ON BOTH Ni_2AL-LDH AND ON ITS CALCINED FORM IN AQUEOUS SOLUTIONS

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INTRODUCTION

Synthetic organic dyes in wastewaters cause problems for the environment and human health [1]. For this reason, several methods have been used for their treatment, in particular adsorption, membrane filtration, coagulation, photocatalysis [2] .

Adsorption has been widely used and developed, as an alternative process, in the separation of dyes from wastewater due to its versatility, low cost, and easy operation.

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, $[M_{1-x}{}^{2+} Mx^{3+} (OH)_2]^{x+} (A^{n-})_{x/n}\cdot mH_2O$, where M^{2+} is divalent (Ni^{2+}) and M^{3+} is trivalent (Al^{3+}) metal cations, A^{n-} is inter-layer exchangeable anions such as CO_3^-,and m is amount of water molecules [3]. Besides, another crucial property of LDH material after calcination (LDO) is the so-called 'memory effect', which is, in fact, a reconstruction of the LDH structure [4].

Few studies were devoted to the treatment of wastewater containing two or more dyes. The adsorption capacity of a dye may be affected by the presence of another dye. So, it is worthwhile to study the multicomponent dye adsorption systems in terms of selectivity and/or affinity of each dye for a given adsorbent as well as competition between dyes for the same adsorption sites.

The objectives of this work are as follows:

(i) The synthesis and characterization of Ni_2Al-LDH and Ni_2Al-LDO materials.

(ii) The use of this materials to remove IC and CR dyes in single and binary system.

RESULTS AND DISCUSSION

CHARCTERIZATION

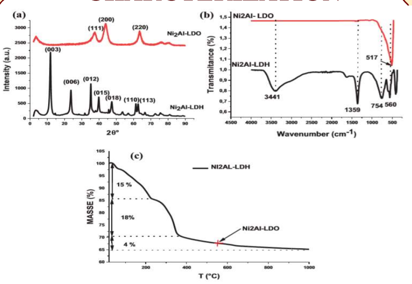

Figure 1 :XRD, IR analysis and ATG

Table 1 : LDH Parameters .

	a (Å)	c (Å)	d (Å)	BET surface (m²/g)
LDH	3.0	22.7	7.5	80.527
LDO	4.2	4.2	4.2	121.64

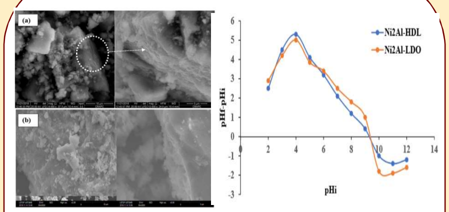

Figure 2 :SEM and PZC Piont

APPLICATION

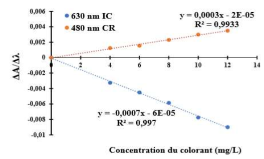

Figure 3 :the calibration curves

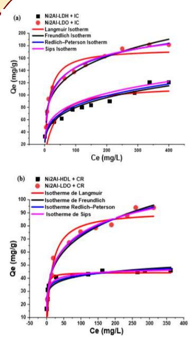

Figure 4 : Adsorption data analysis in single system with different isotherms.

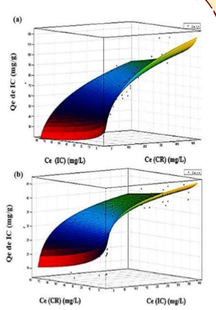

Figure 5 : Adsorption data analysis in binary IC/CR system with Sips .

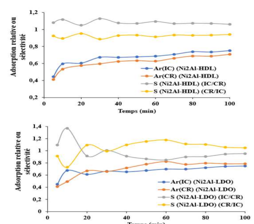

Figure 6: Relative adsorption and selectivity

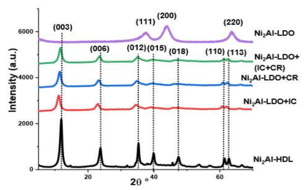

Figure 7: XRD after adsorption.

CONCLUSIONS

- High adsorption capacity of the LDH and LDO 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 are well fitted with Sips isotherm models.
- The adsorption process was dominated by electrostatic interactions and the dyes were not intercalated between the layers

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