ADSORPTION OF DYES YELLOW BEMACID CM-3R AND RED BEMACID CL-BN200 BY A SODIC BENTONITE

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The rejections of textile industry are strongly charged in various dyes, which imposes their treatments. The most current method is to adsorb them on solids having specific large surface, for example clays. For our study we retained a local bentonite, available in quantity, which we purified and transformed in sodic form for the adsorption of two acid dyes provided by BEZEMA.
The obtained results show that the output of adsorption is a function of the structure of the dye and of the pH of the medium.

Keywords: ecology of water resources, structural materials, adsorption, bentonite, sodic, dyes

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Introduction

The presence of dyes in the effluents of manufacturing industries makes the treatment difficult and expensive [1]. This colouring is caused by the dye which is not fixed on textile fibre [2]. Indeed, the types of dyes used are eliminated with difficulty because of their chemical properties which confer to them a stability with respect to oxidants or make them not easily biodegradable because of their aromatic nucleus [3].
The colour makes water unsuitable to the domestic uses and reduces the transmittance of the light thus limiting the growth of the watery plants [4].

The soluble dyes such as the acid dyes are responsible for delicate problems because the traditional treatments of water having been used in the baths as dyeing do not ensure a satisfactory purification [5].
For this purpose we were interested in the use of a montmorillonite of purified MAGHNIA and transform in sodic form. Because of the large smoothness of the particles, in other words with its useful large surface it is equipped with capacity inflating considerable 5 to 30 times compared to its initial volume.
Not forming part of the structure itself and keeping a certain mobility the sodium ions can be also exchanged. They modify also the distance between the layers and thus the reticular distance.

Matters and materials use

Bentonite

The bentonite used is a local clay which has the advantage of being available and to display after modification adsorbent properties comparable with the products of reputation such as mow activated carbon.

Clay is characterized by its permeability, its thermal properties, and its behavior with respect to the diffusion of the radio operator elements [6].

Clays can acquire new properties by various modifications which can open ways of application above suspicion.

The selected bentonite is light; that can be explained by a concentration raised out of carbonates and alkaline. This is confirmed by the pH of 7.

The dyes

The dyes used are:

– Red BEMACID CL-BN 200;

– Yellow BEMACID CM.3R.

The determination of the concentrations in dyes are determined by the absorptance using a standard spectrophotometer UV UNICAM in the wavelength interval 400 to 700 nm.

Characteristics of bentonite

1 Determination of the chemical composition by fluorescence X. Chemical composition consigned to Table 1 by X-ray fluorescence using a spectrophotometer with x-ray fluorescence (PHILIPS MAGIX PW reveals its character montmoriollonite ($SiO_2/Al_2O_3 = 3.83$).

This characteristic makes it possible to classify it among inflating clays, having properties very important to use it as adsorbent material.

Table 1

The chemical composition of sodic bentonite

Oxides	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	SO_3	K_2O	Na_2O	Loss on the ignition
%	67.24	17.53	1.38	0.30	2.74	0.09	0.67	4.8	5.10

Results

Influence of the time of contact

The adsorption of the dyes is rather high: this is because of the hydration of the sodium cation which causes the dispersion of the bentonite [7] thus facilitating the penetration of water in interfoliaceous space and supporting the phenomenon of exchange between bentonite and the coloured solution (Fig. 1).

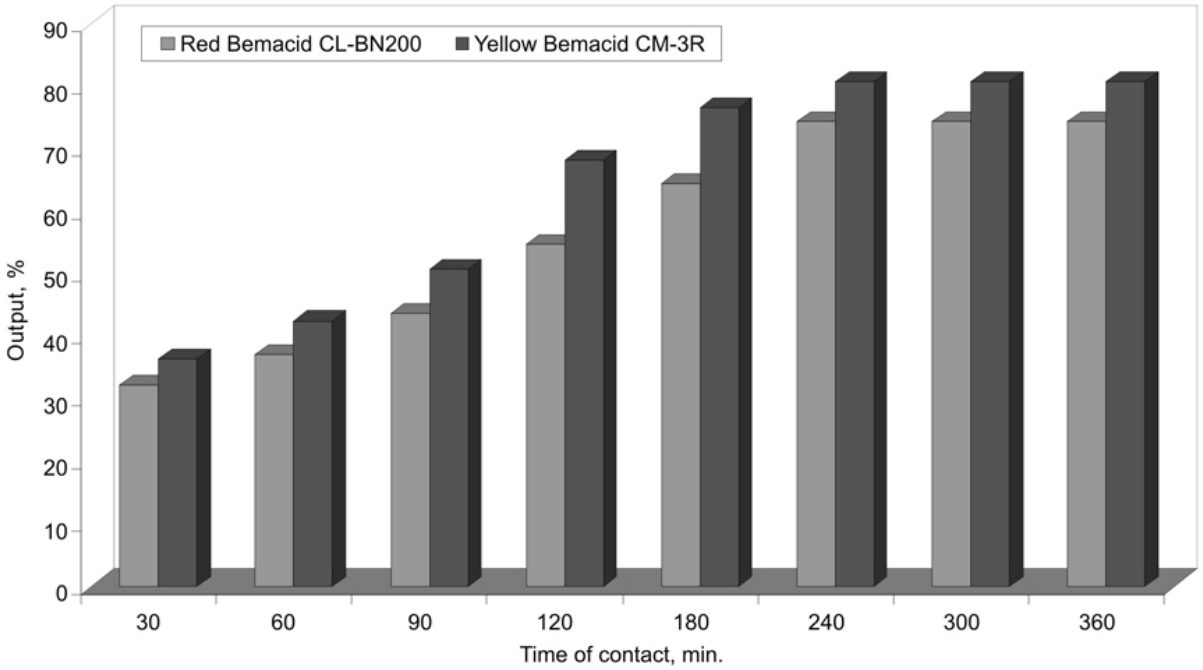

Fig. 1. *Influence of time of contact*

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Influence of pH

With the pH 2 the quantity of the adsorbed dye is high, a fact due to the influence of the H+ cation on miscelle of the sodic bentonite, which causes the attraction of the dye negatively charged (Fig. 2).

Influence of the temperature

When the temperature increases the quantity of adsorbed dye decreases, which allows us to suppose that one is in the presence of an exothermic phenomenon [8] (Fig. 3).

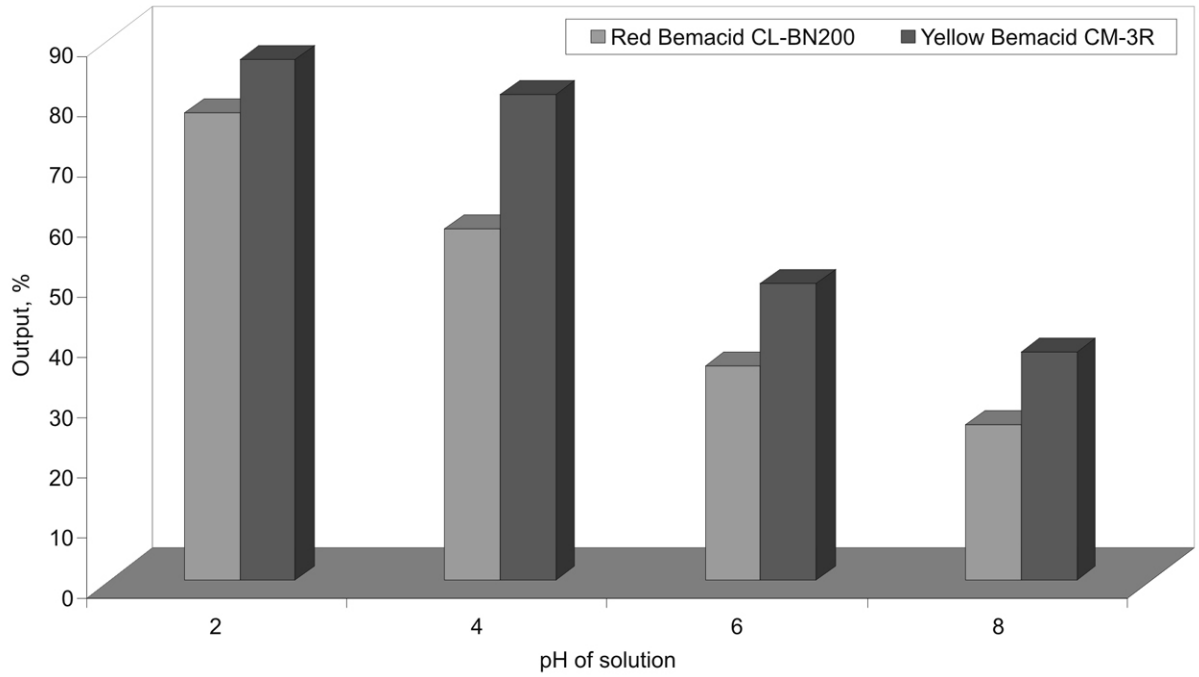

Fig. 2. *Influence of pH*

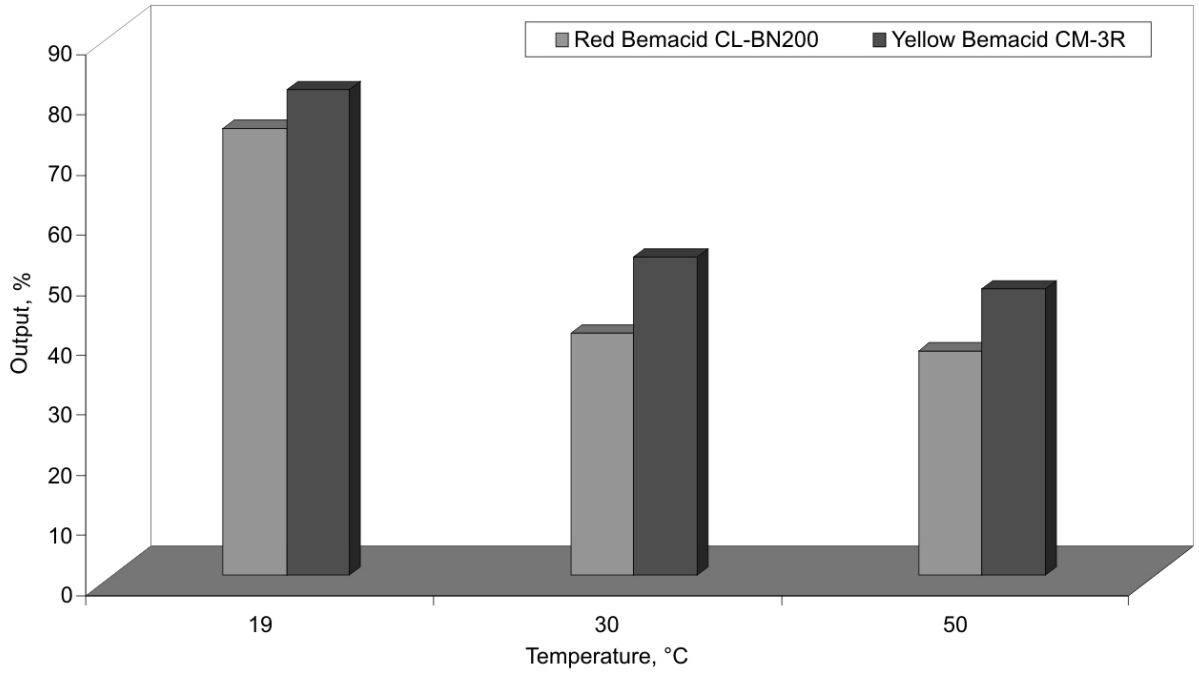

Fig. 3. *Influence of the temperature*

Influence of the concentration *(Fig. 4, 5)*

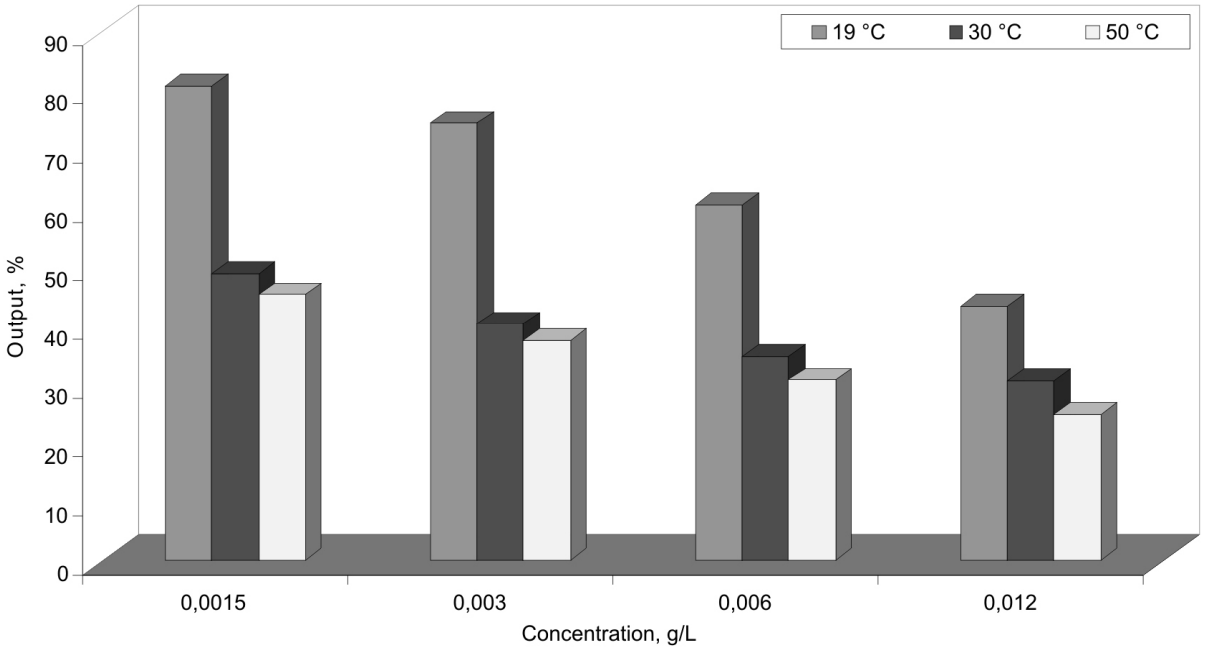

Fig. 4. *Influence of the concentration of red Bemacid CL-BN200*

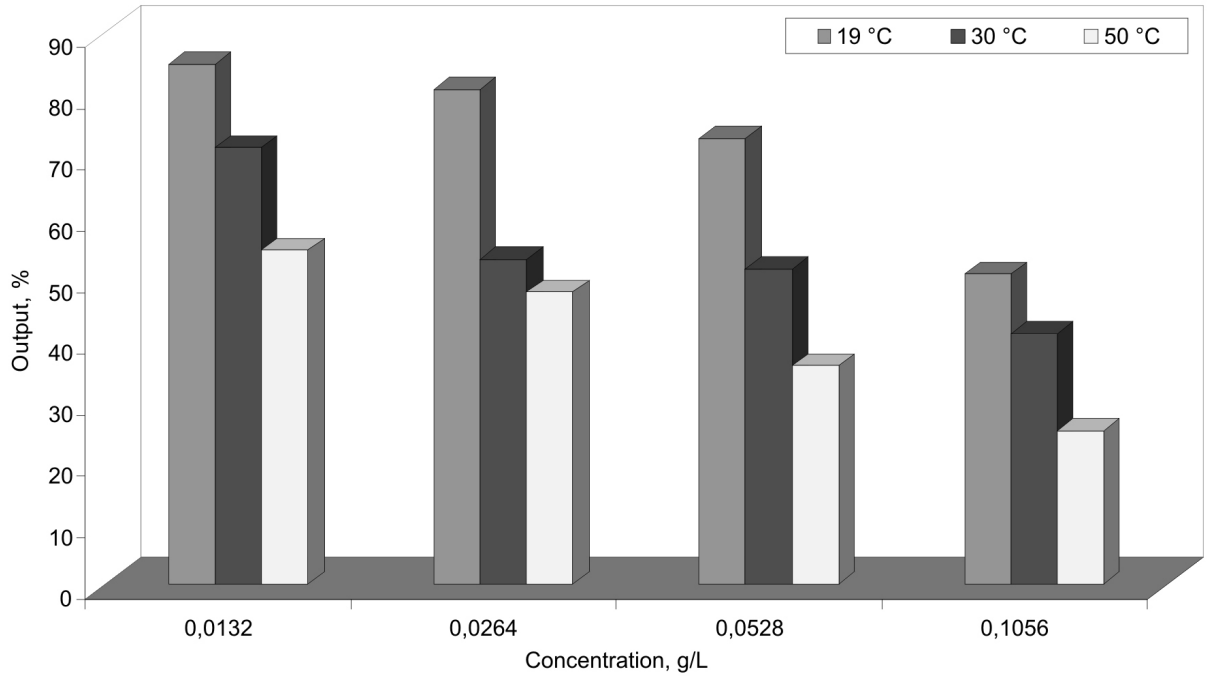

Fig. 5. *Influence of the concentration of red Bemacid CML-3R*

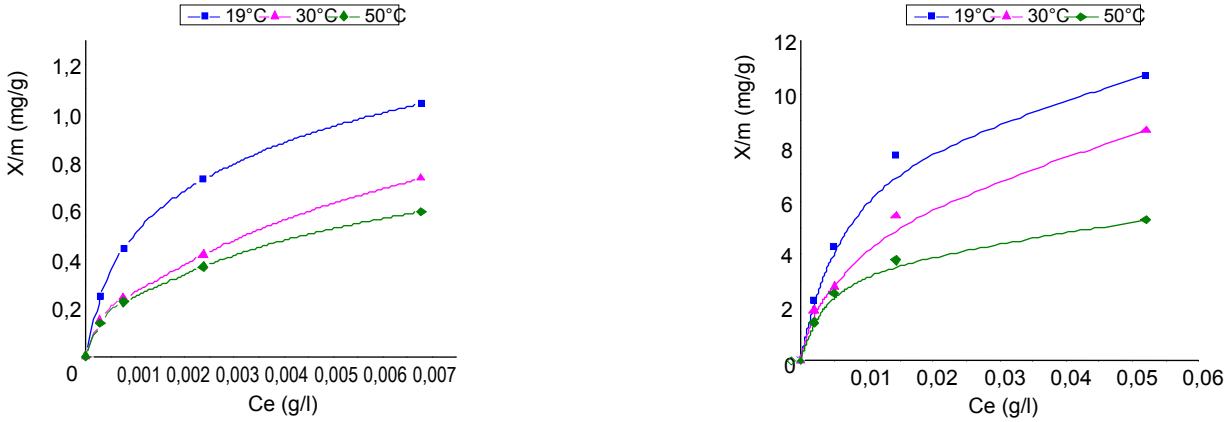

Fig.6. *Isotherms of adsorption of red Bemacid CL-BN200 and Yellow Bemacid CM-3R*

Conclusion

We notice that some parameters giving good performances are:

– temperature 19 °C;

– time 240 min;

– pH 2.

However the yellow dye gives better results; this can be due to the structure of the dye and the difference of solubilities which are of 25 g/l for the red dye and 20 g/l for the yellow dye.

We can say that each dye of the same class can have a different behavior.

This process appears interesting because the treatment by coagulation-floculation gives poor outputs due to the bad quality of the floc which elutriates badly even after addition of coagulant [9].

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