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

N. Ouslimani, M. Maallem

University M’hamed Bougara Boumerdes – Algeria
Faculty of Science of Engineer
E-mail: ouslimanibouberdes@yahoo.fr, maallem_mad@yahoo.fr
Received: 29 Sept 2007; accepted: 31 Oct 2007

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

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 absorbance 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 montmorillonite (SiO2/Al2O3 = 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

<table>
<thead>
<tr>
<th>Oxides</th>
<th>SiO2</th>
<th>Al2O3</th>
<th>Fe2O3</th>
<th>CaO</th>
<th>MgO</th>
<th>SO3</th>
<th>K2O</th>
<th>Na2O</th>
<th>Loss on the ignition</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>67.24</td>
<td>17.53</td>
<td>1.38</td>
<td>0.30</td>
<td>2.74</td>
<td>0.09</td>
<td>0.67</td>
<td>4.8</td>
<td>5.10</td>
</tr>
</tbody>
</table>

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
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
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].

References