REUSE OF RECOVERED DISPERSE DYES WITH CYCLODEXTRINS IN DYEING PROCESS

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Extended abstract

One of the main pollution problems the textile industry faces is the loss of unfixed dyes that remain in the wastewater. In the textile industry generally the obtaining of colours is realized with a tricomy formed by yellow, red and blue in different proportions, so three different molecules remain in the wastewater.

Different techniques are used in order to remove dyes from the wastewater: silica beads, zeolites, activated carbon, chitosan, starch or cyclodextrins (CDs) among others. In this work an Epychloridrin gamma cyclodextrin (EPI-ƴCDs) polymer was used.

The objective of this paper is to demonstrate the viability of the reuse of the encapsulated disperse dyes into the structural cavity of CDs, for a new dyeing process keeping the same proportion in the tricomy so that the same colour is obtained.

Experimental

Preparation of solutions.

The first step was represented by the dyeing process in order to obtain the wastewater. Two different mixes of disperse dyes were tested, their % weight per fibre (w.p.f., amount of dye employed to dye 100 g of fiber) is showed in table 1.

Table 1. Mixtures compositions.

<table>
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<tr>
<th></th>
<th>Disperse Orange 30</th>
<th>Disperse red 167</th>
<th>Disperse Blue 73</th>
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<tbody>
<tr>
<td>Mix 1</td>
<td>0.100</td>
<td>0.130</td>
<td>0.004</td>
</tr>
<tr>
<td>Mix 2</td>
<td>0.090</td>
<td>0.320</td>
<td>0.038</td>
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</table>
The dyeing conditions for all the dyeing processes were: temperature = 128 ºC, time = 60 minutes, liquor rate = 1/15 (relation between weight of fabrics and amount of water). Acetic acid 0.5 cc/l was added as an auxiliary. The dyed fabrics obtained served as reference in the analysis.

**Complex formation**
The second step was the recovery of the dyes from the wastewater with the EPI-\(\gamma\)CDs polymer by maintaining it in agitation for 30 minutes at 25 ºC in a ratio of 50/1 (v/w). After that, the formed complex was recovered by filtration and dried in an oven.

![Figure 1. Left: EPI-\(\gamma\)CDs polymer, Center: Complex formed with wastewater from mix 1, Right: Complex formed with wastewater from mix 2](image)

**Dyeing process**
The last step was represented by the dyeing process with the complex formed, as a raw material, in a new dyeing process, replacing the dyes concentration with 25 % w.p.f, 50 % w.p.f and 100 % w.p.f of the complex dyes/EPI-\(\gamma\)CDs.
Results
The fabrics obtained were characterized by Spectrophotometry obtaining the graphics showed in Figure 3. In each graphic the original fabric obtained is compared with the current dyes and the three concentrations employing the complex formed the EPI-γCDs and dyes.
Conclusions

It is possible to reuse the disperse dyes encapsulated in cyclodextrins after recovering them from wastewater, but obtaining of the original colour is difficult and depends on the formulation. Due the fact that the formation of colour is done with three different molecules, the encapsulation and the release does not occur in the same proportion, leading to new colours.

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References