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Adsorption capacity study of activated bone carbon to remove yellow dye tartrazine from aqueous solution

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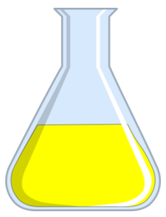
Introduction

With the industry advance, the use of synthetic dyes diffuses between different products. Most colorants have complex aromatic molecular structure and functional azo groups (-N=N-) that make them resistant to light, temperature and oxidants. With this feature, the dye does not degrade easily and it can accumulate in aquatic ecosystems. Colored wastewater is unacceptable aesthetically and cause damage to the environment by changing the pH and color and thus influencing the photosynthetic activity of the aquatic ecosystem, chemical oxygen demand and among other problems. Due to toxicity of these dyes, it is extremely important to monitor then so they do not exceed the levels allowed by the current body.

Materials and Methods

The adsorption was conducted batch, using mechanical shaker. The influence of different parameters were tested: the contact time, pH, temperature and amount of adsorbent.

0,2 g of activated bone carbon



50 mL of tartrazine solution (15 mg/L)

100 rpm

Adsorption assays:

Filtered Milipore 0.45 µm membrane

426 nm spectrophotometer

Results

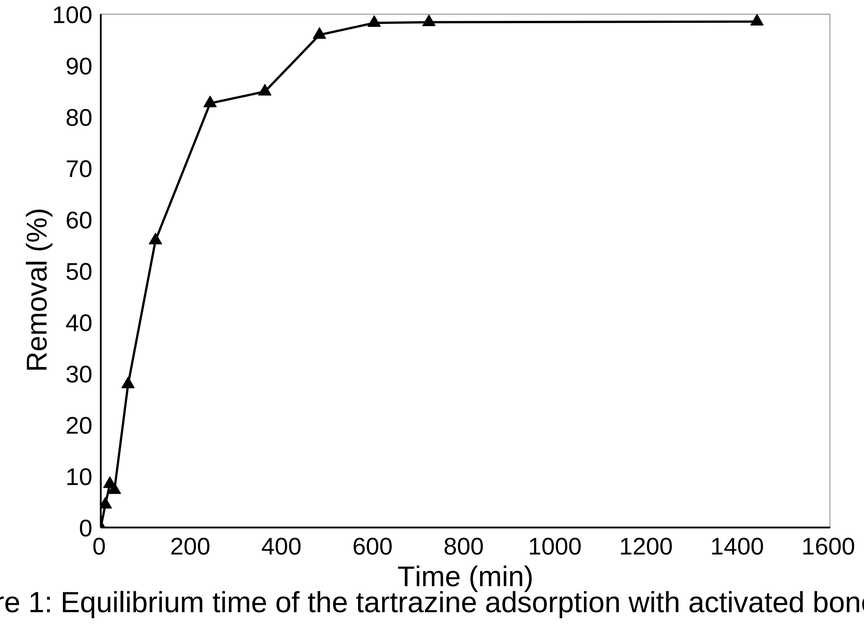


Figure 1: Equilibrium time of the tartrazine adsorption with activated bone carbon. . (mass of adsorbent: 0.2 g, temperature: 25° C, pH: 5)

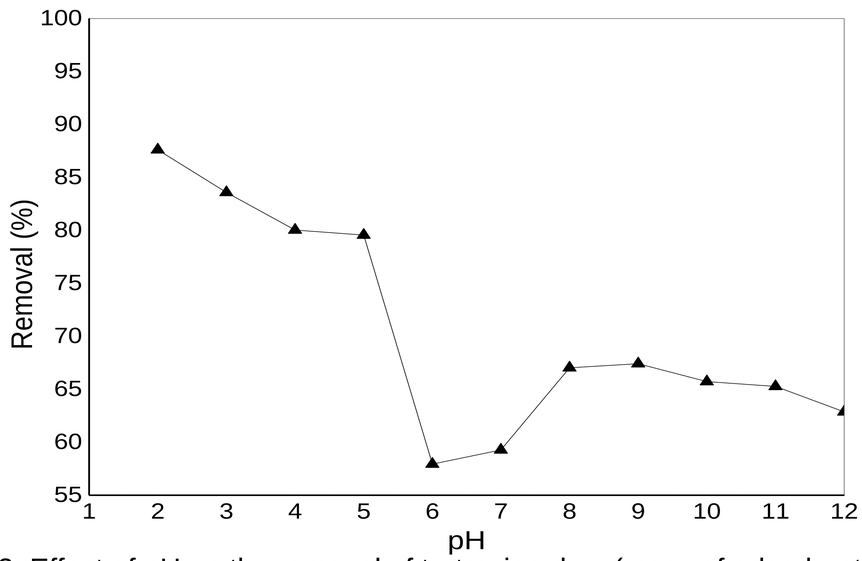


Figure 2: Effect of pH on the removal of tartrazine dye. (mass of adsorbent: 0.2 g, temperature: 25° C)

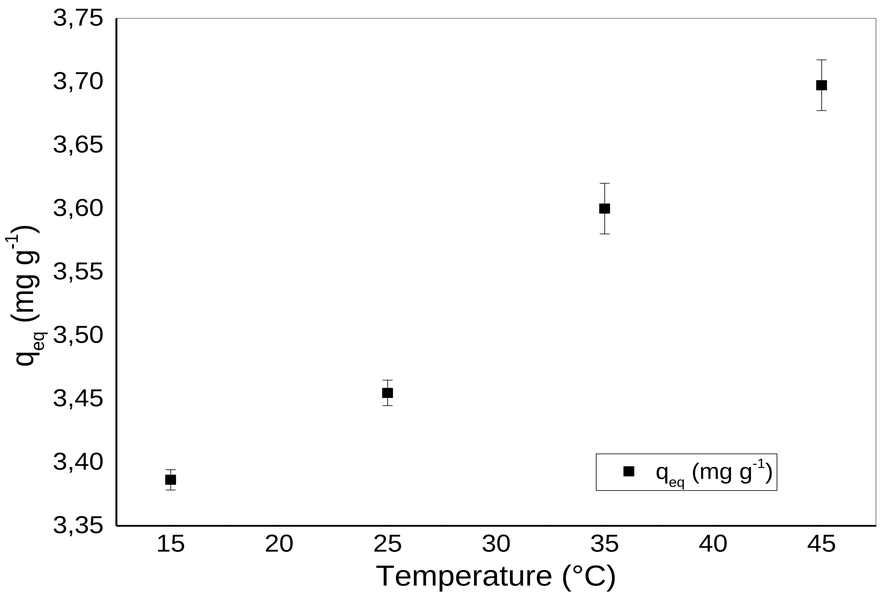


Figure 3: Effect of temperature on the removal of tartrazine dye. (mass of adsorbent: 0.2 g, pH: 5)

Discussion

After 24 hours of contact between activated bone carbon and the tartrazine yellow dye it was observed that the solution got in equilibrium at a time of 10 hours, achieving percentage removal of 95%. Thus, the next experiments were performed at this time. It was found that the best pH for the dye removal was 2. This result can be explained by the fact that tartrazine is an anionic character molecule, and therefore are attracted by H+ ions present in the solution. The best temperature found for the removal of the dye was 45° C, which characterizes the adsorption with activated bone carbon as an endothermic process.

Conclusion

Therefore, the adsorption is a process that can be considered as a preliminary water treatment from food industries so dyes can be removed before being discharged together with the aqueous effluents of industries.

Acknowledgement

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