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Adsorption of an Organic Pollutant from Aqueous Solutions

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ABSTRACT

Casein was employed as an adsorbent in this study for the removal of methylene blue dye. zero charge point were used to characterize it. The influence of experimental parameters such as contact time, pH, the dose of adsorbent and stirring speed on the adsorption yield of methylene blue MB on casein were investigated. Equilibrium was established after 30 minutes with a discoloration percentage of 81.24%. an optimal dose of 7.5g/l of casein will be necessary to fix the maximum of Methylene Blue. The stirring speed of 200rpm is optimal and sufficient to promote contact between the casein particles and the dye The best decolorization was observed at pH=8.1 with a yield of 85.76%. The kinetic study revealed that the surface reaction fits the pseudo second order model.

Keywords: Adsorption, kinetics, Dye, Casein.

1 Introduction

Pollution by dyes is a public health problem which requires environmental protection authorities to provide adequate solutions. Conventional methods of water treatment used to reduce the impact of these pollutants such as precipitation processes [1], ion exchange [1], electrolysis [1], membrane processes, oxidation processes [1], biological separations [1], adsorption and complexation processes. Adsorption is a suitable [2] and attractive [3] method for the recovery of days in diluted industrial aqueous solutions thanks to its speed, reversibility. It has been studied on various adsorbents of different natures, notably in the removal of colorant by plant biomass (Biosorbent) [4], by clays [5], by activated carbon [6]. The adsorption of Methylene Blue on casein was studied to highlight its potential as a low-cost adsorbent for the treatment of coloured water. this study was optimized and described after characterizing casein by the zero-charge point. The parameters influencing adsorption were determined, such as the contact time, pH, the dose of adsorbent and stirring speed.

2 Experimental

The experiments were carried out in glass Erlenmeyer flasks by equilibrating 0.05g of adsorbent with 10ml of dye with a concentration of 5ppm at normal pH of the solution. In order to ensure good contact of the reagents, the mixture is subjected to mechanical stirring at a speed of 200rpm at ambient temperature T= 25°C.

Samples are taken, then centrifuged for 1 min to separate the dye and the adsorbent. The residual concentration of methylene blue is detected by spectrophotometer (UV) at the wavelength which is equal to 664nm.

3 Results and Discussion

Fig.1 shows a pattern characterized by a strong adsorption of day during the day-adsorbent contact from the first 30 min followed by an equilibrium. It has very fast kinetics and the stability could be explained by the saturation of the active sites available on the adsorbent surface.

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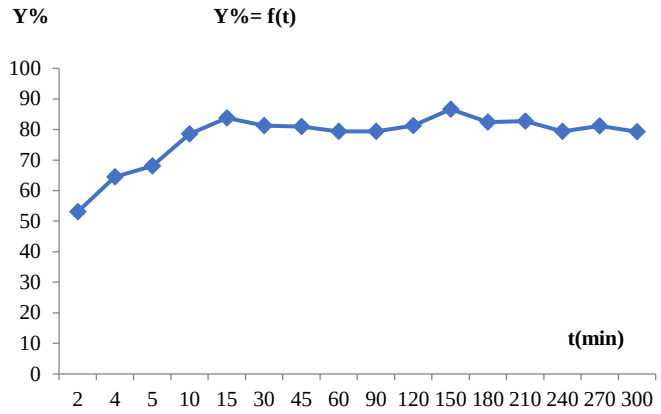

Figure 1: Kinetics of M.B extraction by casein V = 10mL, Wads= 0.05g, φ = 200 rpm, [M.B] =5ppm, pH=6.9, $T=T_{ambient}$

4 Conclusions

The adsorbent we used in this work was effective in dye retention. The experiments showed that the adsorption equilibrium was reached after 30 min and the maximum adsorption occurred at pH= 8.1 and w= 0.05g with a stirring speed of 200rpm. Casein used as an adsorbent is a very promising alternative for the elimination of the dyes in question.

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