SORPTION DYNAMICS OF AZO DYE-DIRECT ORANGE 26 ONTO A CORNCOBS PLANT SORBENT

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ABSTRACT

The azo dye and plant derived sorbent system was investigated in this paper. Direct Orange 26 dye was acquired from Boruta-Zachem Kolor Sp. z o.o. Corncobs obtained from Chipsi Mais Germany were used as the biosorbent. The changes in the dye and sorbent concentrations with time were measured and used for further calculations. The experiments were carried out in a laboratory fixed-bed column. Sorption dynamics were described by a model presented in the literature. It was found that corncobs can be used as a promising sorbent material.

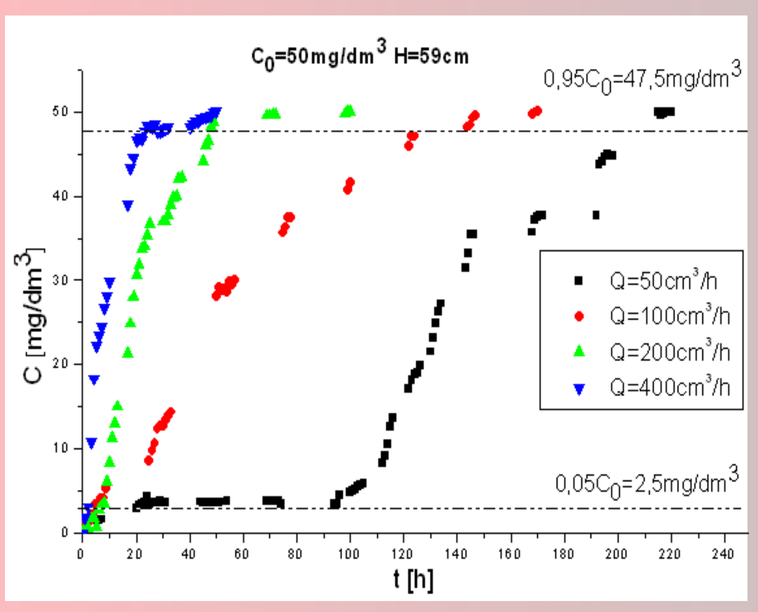

Fig.1. The breakthrough curves depending on volumetric flow rate.

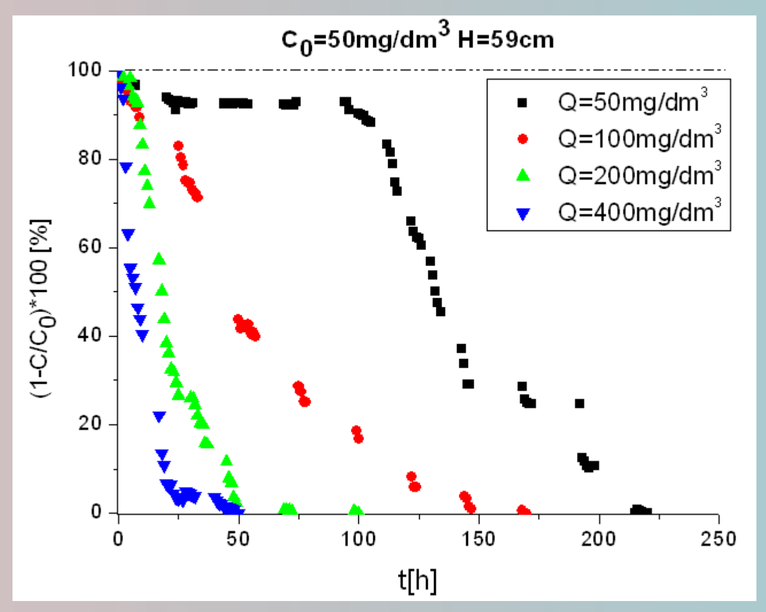

Fig. 2. The bed sorption capacity with time.

Fig. 5. Experimental setup

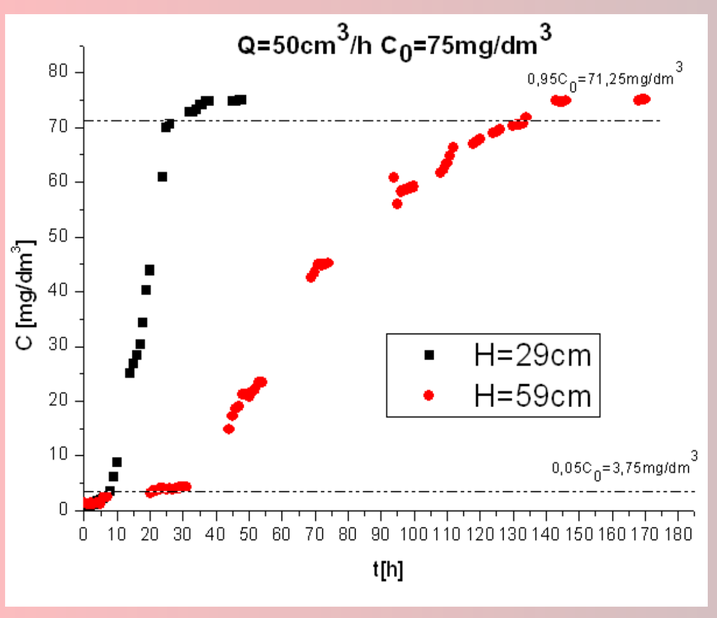

Fig.3. The change of dye concentration with time in the column.

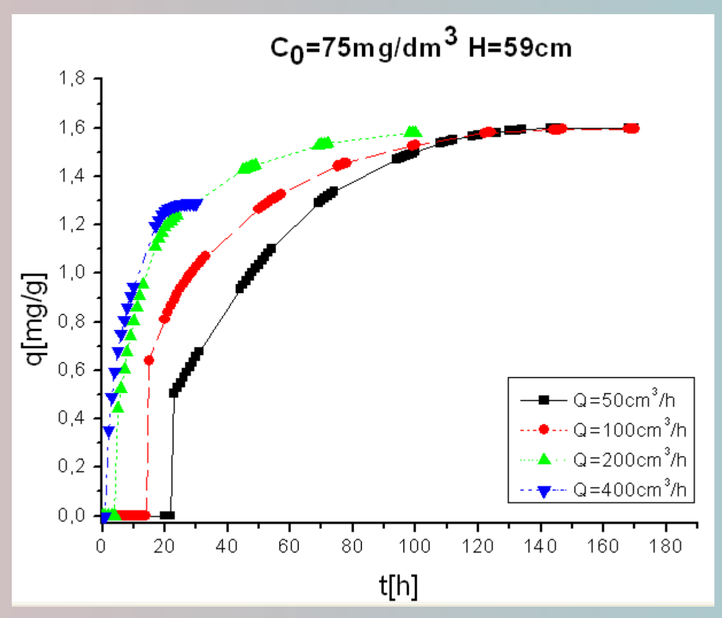

Fig.4. The amount of dye adsorbed per unit weight of sorbent with time.

The study included sorption with variable:

a) volumetric flow rates:
$Q=50cm^3/h$;
$Q=100cm^3/h$;
$Q=200cm^3/h$;
$Q=400cm^3/h$;

b) initial concentrations:
$C_0=50mg/dm^3$;
$C_0=75mg/dm^3$

c) column bed heights:
H=59cm, m=165g;
H=29cm, m=85g .

CHEN SORPTION DYNAMICS MODEL

$$q = \frac{(t_i - \int_{t_0}^{t_i} f(t)dt) \cdot Q \cdot C_0}{m}$$

q – the amount of adsorbed ions [mg/g], Q – volumetric flow rate [dm^3/h], C_0– initial concentration [mg/dm^3], m – adsorbent mass (corncobs) [g], t_i – time [h]

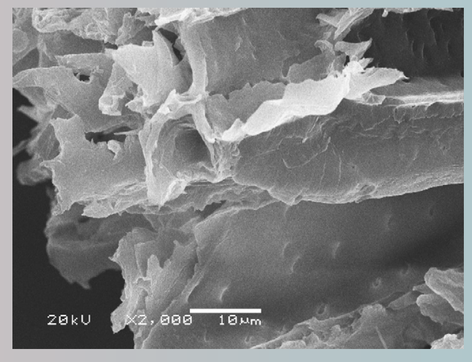

Fig. 2. SEM photo of corncob surface.

Fig. 6. Granulated corncobs

SUMMARY

Studies confirm the usefulness of natural, waste sorbent which are corncobs to decoloration aqueous solutions. The influence of the height of the bed in the column at the lower process speed-height of the deposit makes it shorter, thereby shortening time to reach the point of penetration. As also demonstrated, the dye solution flow rate through the adsorption column has a significant impact on the obtained results, with increased levels decreases the time for reaching the saturation point. There has also affected the quantity of the initial concentration of the solution on the amount of adsorption. The higher concentration resulted in a higher amount of the adsorbed dye.

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