

Research on dispose of wastewater from printing and dyeing by CWF combined with Iron-carbon Microelectrolysis

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Abstract. The carboxymethylchitosan cladding coal ash (CWF) was oxidized by the high temperature using coal ash and sodium carboxymethyl chitosan as raw and processed material for treatment of simulated and actual printing and dyeing wastewater over iron-carbon micro-electrolysis. The results on pH and CWF dosage for effluent dispose were evaluated by the decolorization rate, COD removal efficiency and turbidity removal rate. The experimental results indicated that the decolorization rate was first augmented and then declined with the increase of pH, and attained a peak value when pH was at 5-6. The COD removal efficiency augmented with the augmented of pH, and attained a peak value when pH was 6-7. The turbidity removal rate was first increases and afterwards decreases with the augment of pH, and attained a peak value when pH was at 5-6. Furthermore, the optimum pH for the treatment of simulated dyeing wastewater was 6 over iron-carbon micro-electrolysis, which indicated that the appropriate pH can promote the degradation of wastewater.

1. Introduction

In recent years, dye wastewater has a high concentration of organic matter ($\text{COD}_{\text{Cr}} = 1000\sim 100000\text{mg/L}$) and chroma ($500\sim 500000$), high content of inorganic salts, complex composition and poor biodegradability and hard decoloration characteristics [1]. such as Yuan et al [2] using chitosan on printing and dyeing wastewater flocculation and removal in color, pH value of 6 and the solution containing 1% chitosan under the condition of printing and dyeing wastewater decolorization rate can reach 90%. Yang et al. [3] carboxymethyl chitosan modified, COD removal rate is greater than 95%, COD removal rate of other dye wastewater is more than 92 % [4]. Alkaline material can destroy the hard outer surface of fly ash particles, thus enhancing the activity. Decolorization of reactive red KD-8B dye wastewater [5]. Liu [6] of fly ash was modified after the results show that the best pH value is 12.3, 1 mol/L $\text{Ca}(\text{OH})_2$ solution of the modified flying ash was the best, the decolorization rate can reach more than 99.9%. The weight of the straight NaOH is used to fly ash pretreatment at a temperature of 500 °C, experiments show that the adsorption material is formed with better performance [7]. Pan et al. [8] used the Iron-carbon Microelectrolysis method to dispose the gold orange G analog printing and dyeing wastewater. The decolorization rate was 89%, and the removing efficiency of COD was 41%.



2. Experimental Part

The fly ash added conical flask with NaOH according to the mass ratio of 2.16:1 and NaOH, together with distilled water at the temperature of 83 °C for 7 h, filtration, washing and drying and cooling. Carboxymethyl chitosan NaOH is stirred into sodium type flying ash by screening after activation of 1 h, fast stirring and then slow stirring, filtration, drying, grinding. According to the study of Pan [9], Liu [10]. The pretreatment was as follows: preparation of activated purple simulated wastewater, adjusting pH, activated carbon into wastewater, adsorption, adding iron filings, stirring electrolysis.

We conditionally study on the single factor of flocculation effect. There is the treatment effect of changing mixing time. We take the 6200mL concentration of 0.1g/L after simulated wastewater pretreatment, regulation of pH was 4.5, the dosage of CWF is 0.15g, 5min, 8min, respectively stirring 10min, 12min, 15min, 20min static 60min, respectively sampling measured COD, turbidity and absorbance, calculate the removal rate of turbidity, the removal rate of COD and the decolorization rate. Change the incubation time on the treatment effect, which is shows as follows: 6200 mL concentration of 0.1g/L after simulated wastewater pretreatment, regulation of pH was 4.5, the dosage of CWF was 0.15g, stirring 10min, static 10min, 20min, respectively 30min, 60min, 90min and 120min respectively after sampling measured COD, turbidity and calculation of absorbance, the removal rate of turbidity and COD removal rate and decoloration rate.

3. Consequences and Discussions

3.1. Effects of Wastewater pH on COD Removing Rate

The COD removal rates, turbidity removal rates and decoloration rates of wastewater are treated with iron-carbon microelectrolysis unite CWF to change the pH value of wastewater. The figure was shown in Fig.1.

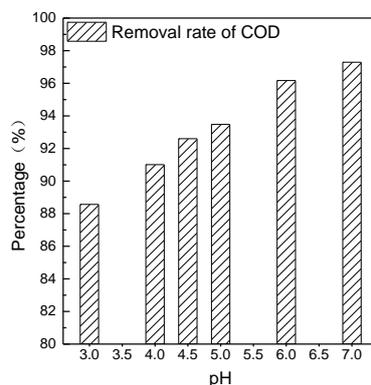


Fig.1 Comparison of the Affect of Wastewater pH on COD Removal Rate

From Fig.1 shows that the best pH wastewater with CWF composite adsorbent disposed by iron carbon microelectrolysis pretreatment values in the acidic range of 4.5-6 as the pretreatment rate, the removing efficiency of turbidity is no distinct effect on the decolorization, but the iron carbon micro electrolysis effect of organic macromolecular chain breaking dye in the molecule, and combined with the settlement and the adsorbent group, the COD is greatly reduced, the removal rate can reach more than 70%.

3.2. Effects of Wastewater pH on Turbidity Removal Rate

From the analysis of Figure 2, it can be seen that when the acidity of pH in wastewater is increased, some of carboxymethyl chitosan in CWF can produce acid dissolution reaction, which greatly reduces the adsorption capacity of CWF. The removal rate of COD is still higher than 80% when the turbidity removal rate is even lower than 20 %.

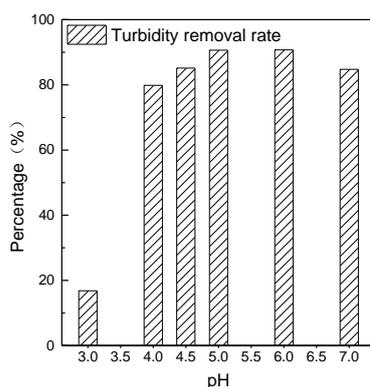


Fig.2 Comparison of the Influence of Wastewater pH on Turbidity Removal

3.3. Effects of Wastewater pH on Decoloration Rate

By the analysis of Figure 3, the decolorization rate is even lower than 20%, and when the range of wastewater pH=6-7, acid reduced, close to neutral, at this time the electrical and CWF of the wastewater in the surface of colloidal particles electrically identical, mutually exclusive. at the same time affected by iron ion, the processed water is slightly yellow, decolorization rate reduced, but the removal rate of COD was slightly decreased, basically stable.

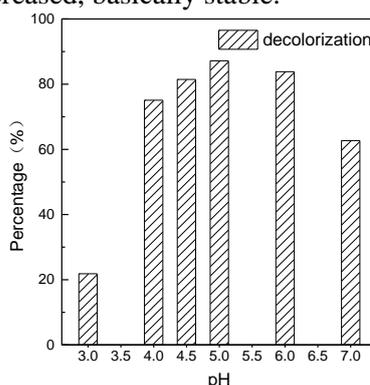


Fig.3 Comparisons of the Influence in Wastewater pH on Decoloration Rate

4. Conclusions

The iron-carbon micro-electrolysis combined with CWF composite agent was used to screen the best experimental conditions. At this point: (1) pH of wastewater is 6-7, the highest removal rate of COD, the trend for the removal rate of COD has been increased; (2) pH wastewater is 5-6, the removal rate of turbidity maximum, the trend for the removing of turbidity augmented first and then declined; (3) the pH of wastewater is 5, the decolorization rate of maximum decolorization trend is first incremental and then degressive.

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