Effect of time on dyeing wastewater treatment

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Abstract. The preparation of carboxymethylchitosan wrapping fly-ash adsorbent using high temperature activated fly ash and sodium carboxymethyl chitosan (CWF), as with the iron-carbon micro-electrolysis process simulation and actual printing and dyeing wastewater. The effects of mixing time and static time on decolorization ratio, COD removing rate and turbidity removing rate were investigated. The experimental results show that the wastewater stirring times on the decolorization rate and COD removal rate and turbidity removal rate influence, with increasing of the stirring time, three showed a downward trend, and reached the peak at 10 min time; wastewater time on the decolorization ratio and COD removing efficiency and turbidity removing rate influence, along with standing time increase, three who declined and reached the maximum in 30min time.

1. Introduction

In recent years, dye wastewater has a high concentration of organic matter (COD₅=1000~100,000mg/L) and chroma (500~500,000), 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 Ca(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 rate 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 6200 mL concentration of 0.1 g/L after simulated wastewater pretreatment, regulation of pH was 4.5, the dosage of CWF is 0.15 g, 5 min, 8 min, respectively stirring 10, 12, 15, 20 min static 60 min, respectively sampling measured COD, turbidity and absorbance, calculate the removing rate of turbidness, the removing rate of COD and the decolorization efficiency. Change the incubation time on the treatment effect, which is shows as follows: 6200 mL concentration of 0.1 g/L after simulated wastewater pretreatment, regulation of pH was 4.5, the dosage of CWF was 0.15 g, stirring 10 min, static 10, 20, 30, 60, 90 and 120 min severally after sampling measured COD, turbidity and calculation of absorbance, the removing rate of turbidness and COD removal rate and decoloration rate.

3. Results and Discussion
Effects of mixing time on COD removing rate, turbidness removing rate and decoloration ratio were investigated. The COD removal rates, turbidity removal rates and decoloration rates of wastewater are treated with iron carbon micro electrolysis combined with CWF to change the pH value of wastewater. The figure was shown in Fig.1.

![Fig.1 Comparison of The Effect of Hybrid Time on the Effect](image)

We can see from Fig.1, increasing the stirring time and can make better flocculation effect, because the processing liquid is fully stirring after floc formation, dense, and continuously stirring let some floc fragmentation and suspended in solution, the treatment effect is reduced. After 30 min, the rate of treatment also increases because some of the dye molecules are absorbed by CWF after stirring. Therefore, the mixing time can only be controlled at 10 min and the optimum treatment effect can be achieved. There are effects of setting time on COD removing rate, turbidity removing rate and decoloration rate. The COD removal rates, turbidity removal rates and decoloration rates of effluent disposed with iron carbon microelectrolysis combined with CWF are only shown to be figure 2.
Fig.2 Comparison of the Effect of Resting Time

From Fig 1 shows that the fixed pH, CWF dosage and stirring time, only to change the static time, observing the decolorization ratio and COD removing rate and the removing rate of turbidity changes, the treatment effect and optimization with increasing holding time, reached the highest point at 30min, thereafter, with the increase of time. Effect tends to slow or even decline, so the best holding time is 30min.

4. Conclusion

(1) Using ferric carbon micro electrolysis combined with sodium carboxymethyl chitosan modified fly ash composite agent, the simulated printing and dyeing wastewater was treated by orthogonal test, and the optimum experimental conditions were screened.

(2) When the mixing time was controlled at 10 min, the optimum COD removing rate, turbidness removing rate and decolorization rate were achieved.

(3) The settling time was 30 min, and the optimum COD removal efficiency, turbidity removal rate and decoloration ratio were realized.

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References

[1] Chao Yang. Studying on the treatment of dye wastewater by Chitosan Composite Fly Ash [D]. Nanjing Forestry University, 2009

[2] Yihua Yuan, Xinghua Lai, Chuxin Chen and Xian HS“There is flocculation and decoloration effect of Chitosan on printing and dyeing wastewater” Applied Chemistry, Vol.17, No.2, 2000, PP-217-218

[3] Zhikuan Yang, Yang Yuan and Lifen Cao“Studying on decolorization of water soluble dye wastewater by Carboxymethyl Chitosan” Environmental Science and Technology, Vol.2, 1999, PP-8-10

[4] Pengfei Wang“Research progress of comprehensive utilization of fly ash”Power Tech and Environmental Protection, Vol.22, No.2, 2006, PP-42-44

[5] Zhenhua Hao “The application of fly ash in urban road engineering and the exploration of the proportion of two grits and gravel base”Science and Technology Information, Vol. 36,2007,PP-171-172

[6] Hong Liu“Treatment of reactive red KD-8B dye wastewater by fly ash”Industrial Safety and Environmental Protection, Vol. 31, No.11 ,2005,13-15

[7] Shimizu N, Misaka N, Utani KSelective “Formation of Na–X Zeolite from Coal Fly Ash by Fusion with Sodium Hydroxide Prior to Hydrothermal Reaction”Journal of Materials Science, Vol.28, No.17, 1993, 4781-4786
[8] Quan Pan, Hui Wang, Yujiao Yang and Gongwu Song “Study on treatment of printing and dyeing wastewater by iron and carbon micro electrolysis” Journal of Hubei University (Natural Science Edition), Vol.33 No.2, 2011, 165-167

[9] Lifeng Zhou, Xueing Fei, Wanqing Li Jiajun Chen and Qiuli Li “Pharmaceutical wastewater by iron carbon micro electrolysis experimental study” Environmental Science and Management, Vol.35 No.5, 2010, 101-102

[10] Wei Liu. Study on the application of iron carbon micro electrolysis for the treatment of refractory organic wastewater [D]. Central South University, 2011