Study on Treatment of Secondary Sedimentation Wastewater by Sodium Hypochlorite Oxidation, Activated Carbon Adsorption and Coagulation Precipitation

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Abstract
In this paper, COD_{Cr} index was adopted as the test item, and the wastewater from the secondary sedimentation tank of a sewage treatment plant selected was treated by the method of "sodium hypochlorite oxidation - activated carbon adsorption - coagulation precipitation". The results showed that the removal rate of COD_{Cr} reached 57.3% by the treatment of "sodium hypochlorite oxidation - activated carbon adsorption - coagulation precipitation". Therefore, this method can improve the removal rate of COD_{Cr}, can make the wastewater discharging standard, and for the project provides data support to better treatment of industrial wastewater.
Keywords Secondary settling tank; COD_{Cr}; Fenton oxidation; Sodium hypochlorite oxidation; Treat reach the standard
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1. Introduction
The rapid development of economy not only promotes social progress, but also brings harm to the environment, which makes pollution become a big problem, among which water pollution is the top priority. In order to better control the water pollution, in the town built a sewage treatment plant in China, the industrial wastewater or sewage treatment, so as to improve water quality [1-4], in which the second pond, the sewage treatment plant is one of the key processing unit, will directly affect the biochemical treatment system of effluent water quality and return sludge concentration, its running state is related to water index [5-6] for the factory. To this, this study will be activated carbon adsorption materials as well as the coagulant polyaluminium chloride (PAC) and polyacrylamide (PAM) is applied to the sodium hypochlorite oxidation - activated carbon adsorption and coagulation precipitation "integrated oxidation method [7-12], to deal with the second pond wastewater, by improving the removal rate of COD_{Cr}, prompting wastewater treatment standards, to provide experimental data for water treatment engineering.

2 Experiment
2.1 Routine water quality indexes
The pH value was determined by glass electrode method, chromaticity was determined by dilution ratio method, total phosphorus was determined by ammonium molybdate spectrophotometry, and COD_{Cr} was determined by potassium dichromate method [13].

2.2 Sodium hypochlorite oxidation of wastewater
2.2.1 Oxidation experiment and adsorption-coagulation secondary treatment
Under the pH condition of the raw water from the secondary sedimentation tank, 0.2‰, 0.5‰, 1‰, 1.2‰ and 1.5‰ sodium hypochlorite solutions (free chlorine 5.2%) were added for oxidation reaction for 1h. After the reaction, partial samples were taken for static treatment. After precipitation, the supernatant was taken to detect COD_{Cr}.

The effluent from the above five groups of experiments was added with 0.5‰ activated carbon for adsorption reaction for 1h. After the reaction, 10%PAC solution of 2mL and 2.5‰PAM solution of 2mL were added. After static precipitation, the supernatant was taken to detect COD_{Cr}. Under this reaction condition, the flogs have good sedimentation performance, and activated carbon powder is the agglomeration sedimentation within 30 seconds.

2.2.3 Activated carbon adsorption - coagulation sedimentation
Under the condition of raw water pH, the dosage of fixed sodium hypochlorite solution was 1‰. After oxidation reaction for 1h, activated carbon of 0.5‰ was added. After adsorption for 1h, 10%PAC solution of 2mL and 2.5‰PAM solution of 2mL were added for flocculation and precipitation.

3 Results and discussion
3.1 Test results of raw water samples
The raw water samples were tested according to the method described in 1.1. The water quality of the raw water

samples was light brown, and their pH, COD_{Cr}, total phosphorus and chromaticity were shown in Table 1.

Table 1 the second pond water quality inspection situation

Water source	pH	COD_{Cr} mg/L	Total phosphorus mg/L	Chroma Diluted multiples
Secondary sedimentation tank effluent	7.77	183	0.4	50

3.2 Sodium hypochlorite oxidation experiment

3.2.1 Oxidation effect of sodium hypochlorite

As described in 2.3.1, the COD_{Cr} of water samples was determined at different sodium hypochlorite content, and the adsorption-coagulation secondary treatment was performed for each water sample. The COD_{Cr} of supernatant, sodium hypochlorite content and the effect of adsorption-coagulation secondary treatment on the oxidation effect were also measured, as shown in Fig. 1.

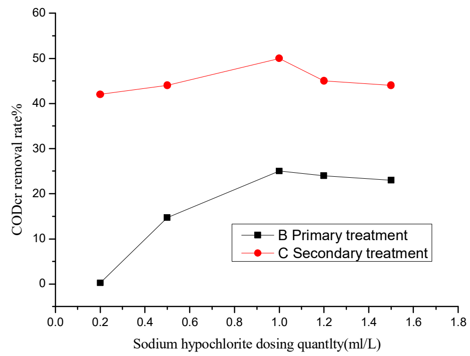

Fig. 1 influence of primary treatment and secondary treatment on COD_{Cr} removal rate

Fig. 1 shows that the removal rate of COD_{Cr} increased significantly with the increase of sodium hypochlorite dosage. When 0.2‰, 0.5‰ and 1‰ sodium hypochlorite were added to water samples, the removal rate of COD_{Cr} showed a linear increase. At the dosage of 0.2‰, the removal rate of COD_{Cr} was only 3%, while at the dosage of 1‰, the removal rate of COD_{Cr} was increased to 25.9%. Therefore, when the dosage of sodium hypochlorite was 1‰, the removal rate of COD_{Cr} in wastewater was the highest and fenton oxidation treatment had the best effect.

Under the condition of 1‰ sodium hypochlorite oxidized water, the secondary treatment of activated carbon adsorption coagulation further strengthened the removal effect of COD_{Cr}. The concentration of COD_{Cr} could be reduced from 135.5mg/L to 92mg/L, and the removal rate of COD_{Cr} increased by 23.8% on the basis of the original 25.9%, and finally reached 49.7%. However, COD_{Cr} did not continue to decline in the simple secondary treatment of 1‰ sodium hypochlorite oxidized water, indicating that activated carbon adsorption played a dominant role in the secondary treatment.

3.2.2 Influence of activated carbon dosage

As described in 2.3.2, COD_{Cr} of supernatant was determined at different amounts of activated carbon, and its influence on secondary treatment was shown in Fig. 2.

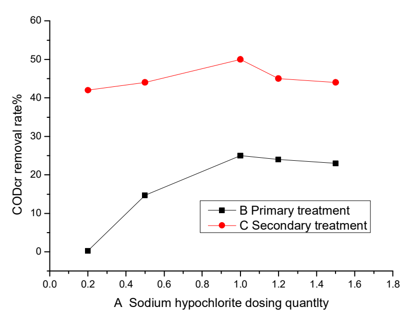

Fig. 2 effect of activated carbon on CODcr removal rate

It can be seen from Fig. 2 that the effect of adsorption-coagulation secondary treatment increases with the addition of activated carbon, and the effect of adsorption-coagulation secondary treatment greatly enhances the removal of COD_{Cr} from the oxidized water of sodium hypochlorite. When the dosage was 0.1‰, the removal effect of COD_{Cr} could be increased by 16.2%. When the dosage was 0.5‰, the removal effect of COD_{Cr} was increased by 40.9%, and the total removal rate of COD_{Cr} was 56.2%.

3.2.3 Activated carbon adsorption - coagulation sedimentation experiments

As described in 2.3.3, CODCr of water samples was determined under the best conditions, and the treatment effect was shown in Table 2

Table2 Processing effects under optimal conditions

conditions	COD_{Cr} mg/L	COD_{Cr} average mg/L	COD_{Cr} Removal rate%
Best condition	82 76	78	57.3

It can be seen from Table 3 that under the optimal conditions of sodium hypochlorite oxidation experiment, the total removal rate of CODCr can reach 57.3%, and the CODCr value of wastewater can be reduced from 183 to 78, meeting the pollutant discharge standard and meeting the discharge standard, providing data support for better treatment of industrial wastewater.

4. Conclusion

Based on the data of the above projects, we can know that the effluent quality from the second sedimentation tank of the sewage plant can be treated with the oxidation method of "sodium hypochlorite oxidation - activated carbon adsorption - coagulation precipitation" to reach the standard. Through the treatment of "sodium hypochlorite oxidation - activated carbon adsorption - coagulation precipitation", when the sodium hypochlorite solution dosage is 1‰, the oxidation reaction time is 1h and 0.5‰ of activated carbon is added for the secondary treatment, the removal effect is the best. At this time, the removal rate of COD_{Cr} reaches 57.3%. Among them, the contribution rate of the wastewater itself to COD_{Cr} removal was 9.3%, and the mechanical stirring method was better than the aeration stirring method.

Meanwhile, from the perspective of economic benefits, the treatment costs of this treatment method are shown in Table 3. Therefore, this method can improve the removal rate of COD_{Cr}, prompted wastewater discharging standard, can meet the economic benefits of sewage treatment plant, and for the project provides data support to better treatment of industrial wastewater.

Table 3 Cost of sodium hypochlorite treatment

Drug kinds	Unit price yuan /t	The dosage g/L	Processing cost yuan /t
Sodium hypochlorite	700	1	0.7
PAC	2000	0.2	0.4
PAM	9000	0.005	0.045
Activated carbon	3500	0.5	1.75
Sludge (dry)	3000	0.3	0.9
Total			3.795

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