NEW WATER TREATMENT AGENT PREPARED FROM A "WASTE ACID FILTER CAKE"

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Coagulant, also called water treatment agent, is used in coagulation processes. Coagulation process is an important unit in treating water and wastewater, which mainly removes colloids and small particles which can not precipitate by themselves. Coagulants can be divided into inorganic, organic and microbial types. Inorganic coagulants will hydrolyze quickly after it is once added into water samples. And then its hydrolysis products will react with the pollutants negatively charged, such as charge neutralization/destabilization, bridging, and sweeping, forming some flocs which can precipitate, thus achieving the purpose of eliminating pollutants after solid-liquid separation.

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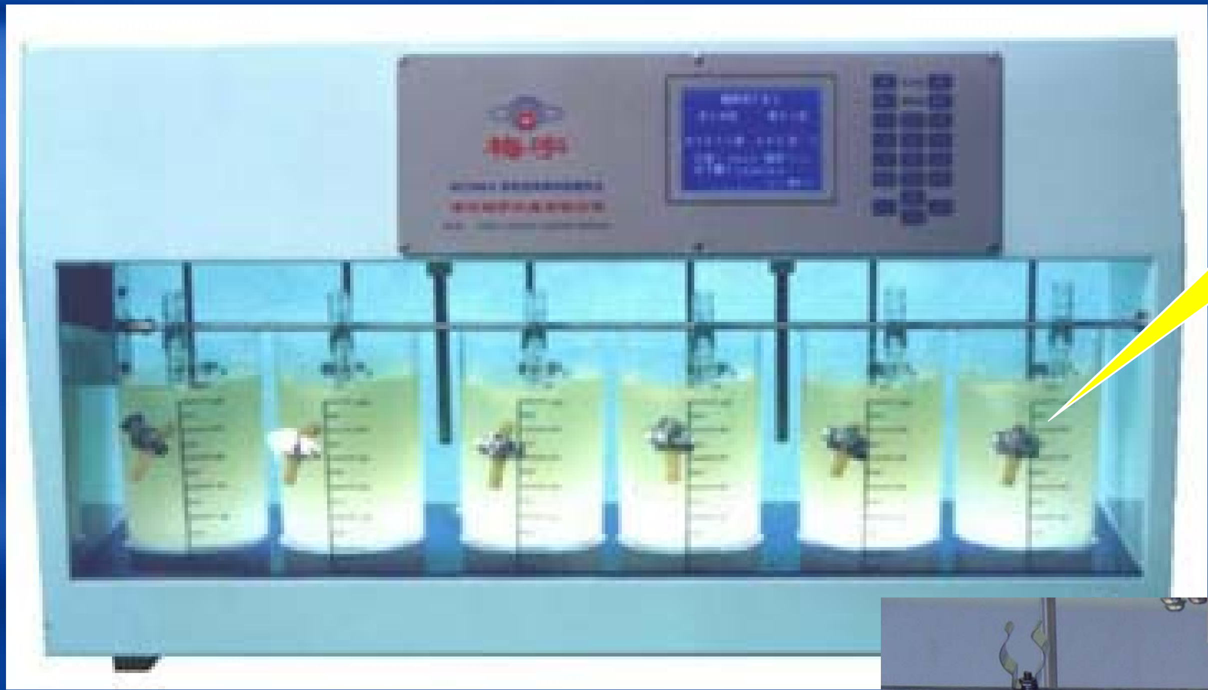
M-PTF coagulant

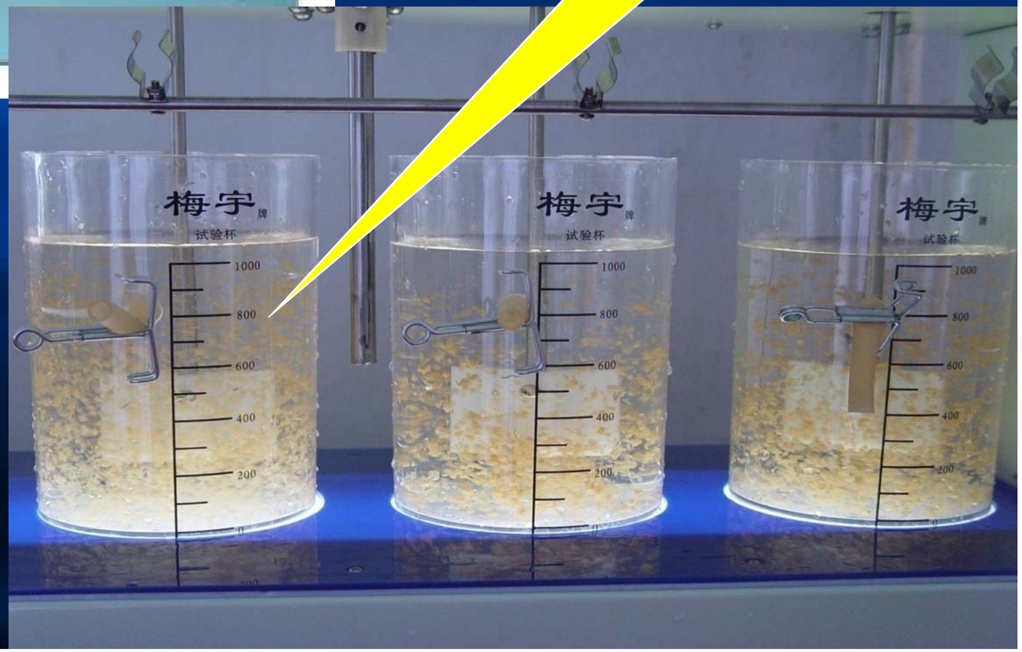
Coagulation behaviour of M-PTF

3 **Research conclusions**



Coagulant

Flocs



Content

1 Research background and significance

China, experiencing rapid development, has become one of the countries which were seriously polluted by solid wastes.

The solid waste in China was over 6 billion tons currently and increased rapidly at annual growth of 10%

1 Research background and significance

Most of solid wastes discharged in one point maybe have their values in other points, so, resource disposing becomes one of the main treating methods

Preparation of various inorganic and organic coagulants using various solid wastes has become a promising focus in the field of water and wastewater treatment

1 Research background and significance

Preparation of various inorganic and organic coagulants using various solid wastes has become a promising focus in the field of water and wastewater treatment

1 Research background and significance

China ... itanium
white

Two n ... d
Chlori

Preparation of M-PTF using WAFC has its theoretical and practical basis, according with the aim of "waste control by waste".

Lots of wastes and byproducts are generated

"Waste acid filter cake" (WAFC)" (containing elements of Ti, Fe, Al, Si, etc ($w(TiO_2)$=70−73%, and $w(Fe_2O_3)$=7−9%)) coming from the washing process

Fe, Al and Si are often important components for producing inorganic coagulants, while Ti is a new element for prepareing water purifying agents. Fe, Si and Ti are all non-toxic.

Fig.1 Pictures of (a) "Waste acid filter cake" (WAFC)

2 Research results

M-PTF coagulant

M-PTF

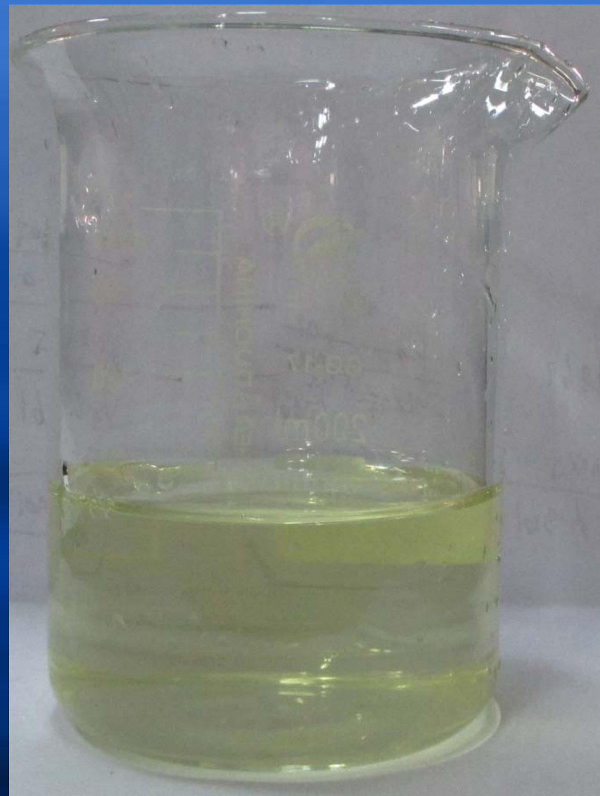
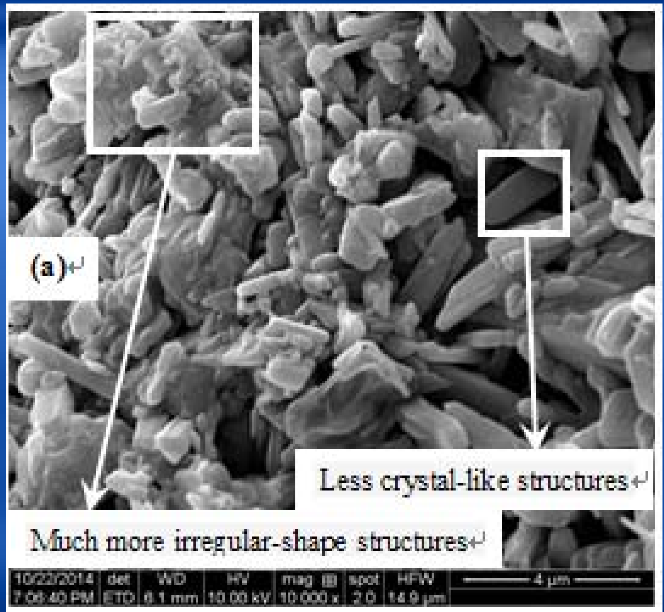


Fig.1(b) Pictures of solid M-PTF and liquid M-PTF

2 Research results

M-PTF coagulant

M-PTF



PAC

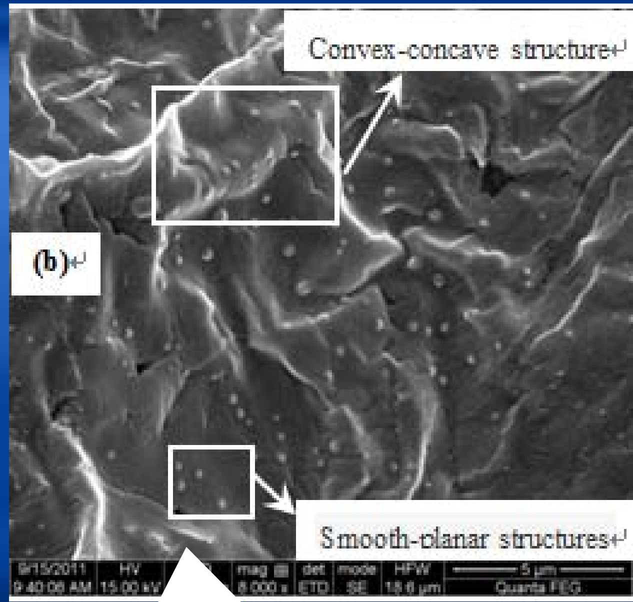


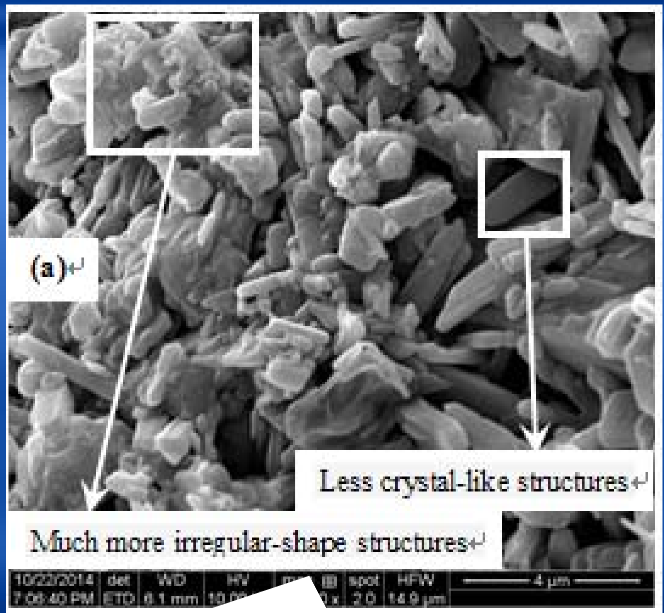
Fig.3 Surface morphology of (a) M-PTF (×10000) compared … f (b) PAC (×8000)

PAC showing excellent coagulation behavior has been widely used around the world for several decades, especially in China.

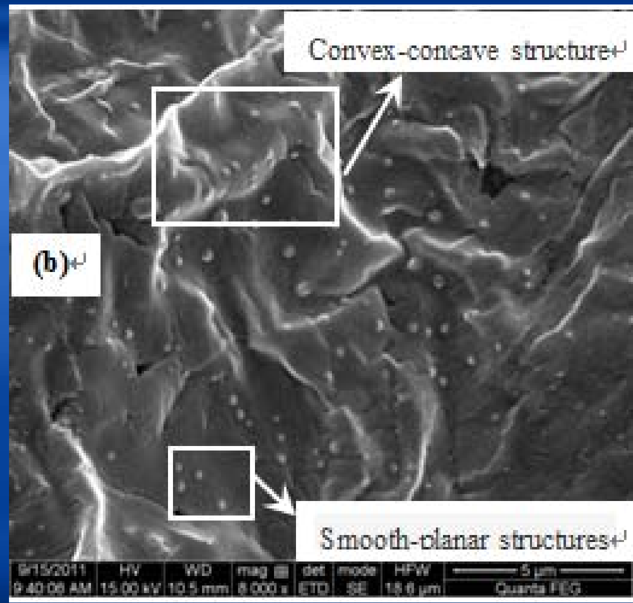
2 Research results

M-PTF coagulant

M-PTF



PAC



Fi… …ology of (a) M-PTF (×10000) compared with that of (b) PAC (×8000)

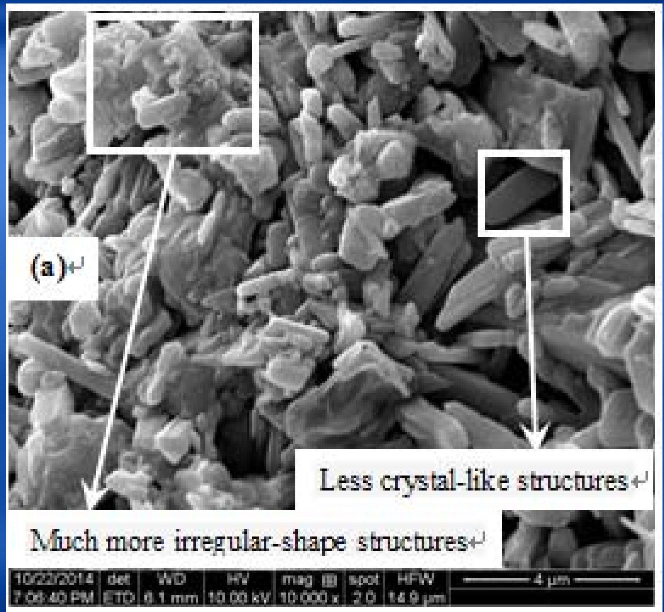
The surface morphology of M-PTF is so complex, and appeared to be some sort of network structure which was built up by a variety of structures having large surface area and mainly consisted of some irregular and crystalline-like structures, in which the dominant structure was irregular type.

It can be inferred from the complex surface structure that M-PTF was a complex polymer copolymerized by Fe, Ti and many other ions.

2 Research results

M-PTF coagulant

M-PTF



PAC

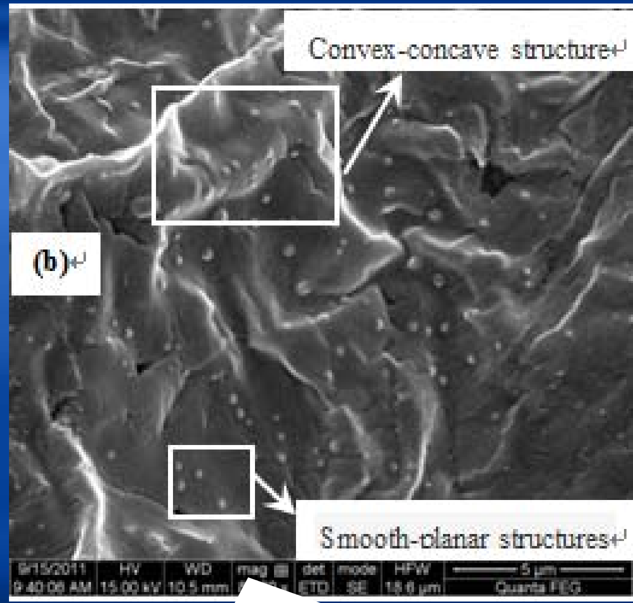


Fig.3 Surface morphology

PAC was composed of a sort of irregular mountain appearance of convex-concave structure, in which some morphology presented a large area of smooth plane, thus leading to smaller surface area of PAC than that of M-PTF.

Coagulation behaviour of M-PTF

Influence of dosage

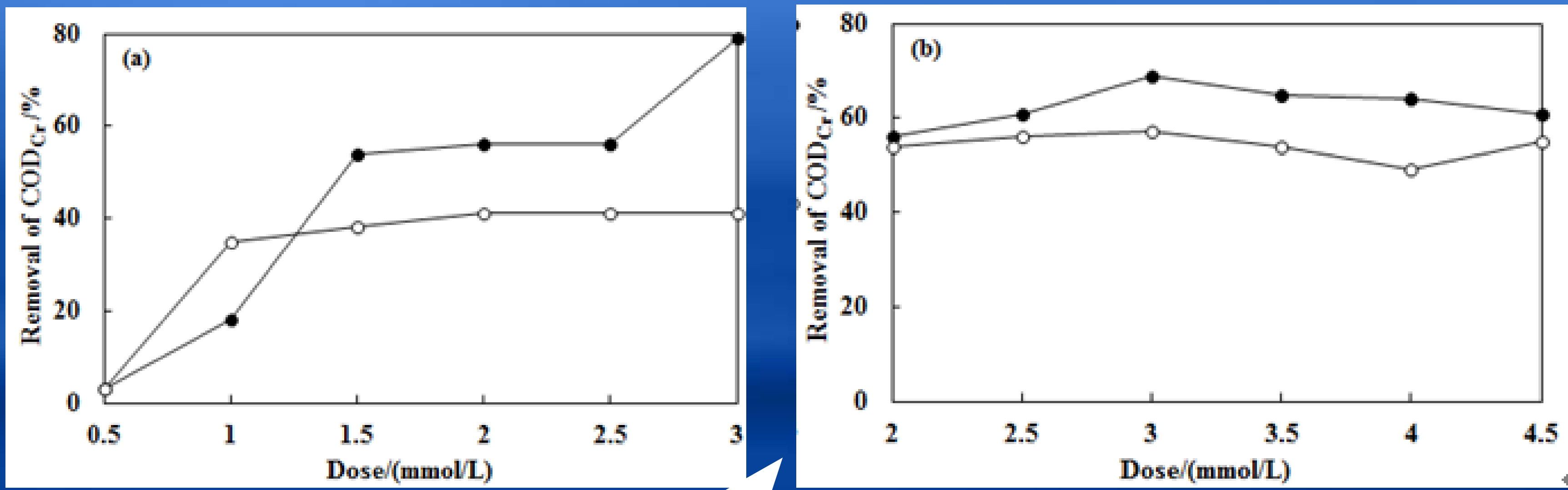


Fig.4 Influence of dosage on removal of C… r by M-PTF and PAC in treating (a) simulated dyeing wastewater and (b) sewage. M…) and PAC (○). The error bars for all the data points represent the standard error of t… ee experiments

M-PTF gave higher COD removal than PAC for the two types of wastewaters.

2 Research results

Coagulation behaviour of M-PTF

Influence of dosage

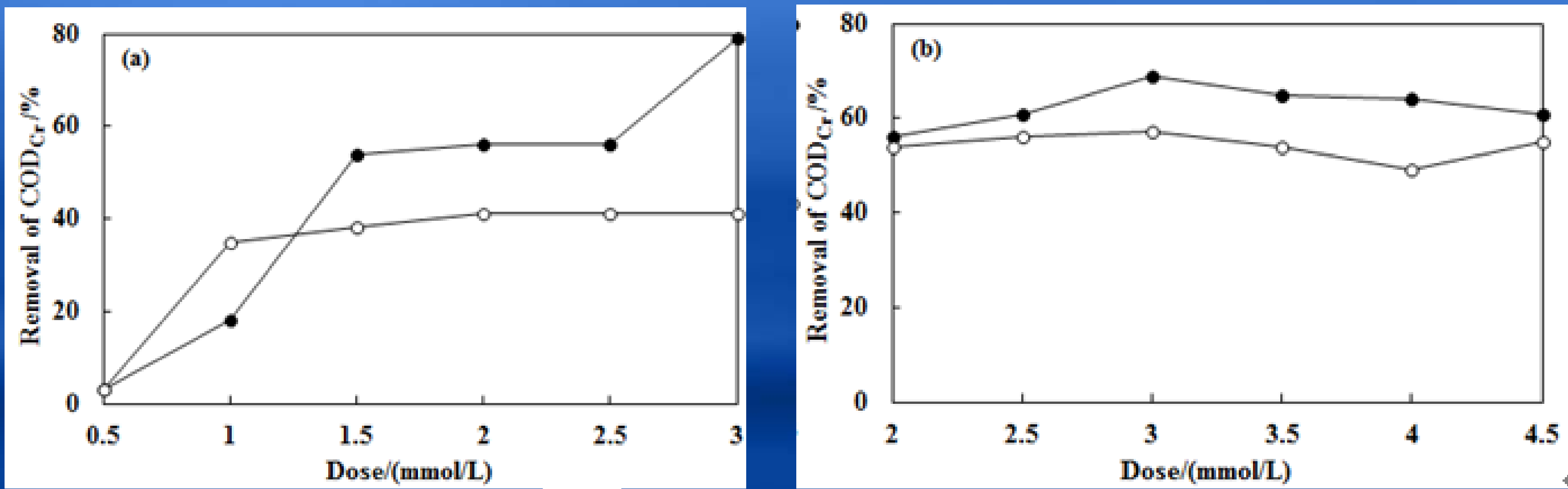


Fig.4 Influence of dosage on remo ... ODCr by M-PTF and PAC in treating (a) simulated dyeing wastewater and (b) sewage ... and PAC (○). The error bars for all the data points ... ts

The greatest COD removal by M-PTF achieved about 80% at dosage 3 mmol/L, more 40% than PAC at the same dosage. While PAC posed the greatest COD removal (35%) at dosage 1 mmol/L, and then almost unchanged with the increasing of dosages.

Coagulation behaviour of M-PTF

Influence of dosage

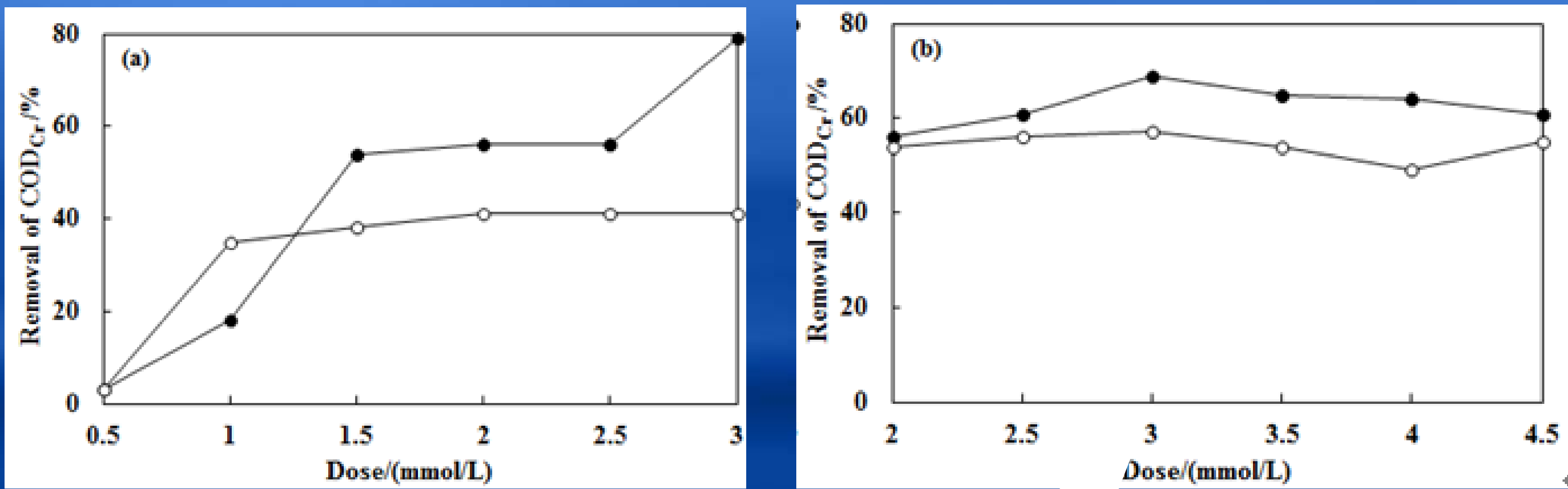


Fig.4 Influence of dosage on removal of CODCr by M-PTF and ... in treating (a) simulated dyeing wastewater and (b) sewage. M-PTF (●) and PAC (... rror bars for all the data points represent the standard error of the mean of three experi...

M-PTF gave the greatest COD removal (around 70%) at dosage 3 mmol/L, more 10% than PAC.

2 Research results

Coagulation behaviour of M-PTF

Influence of coagulation pH

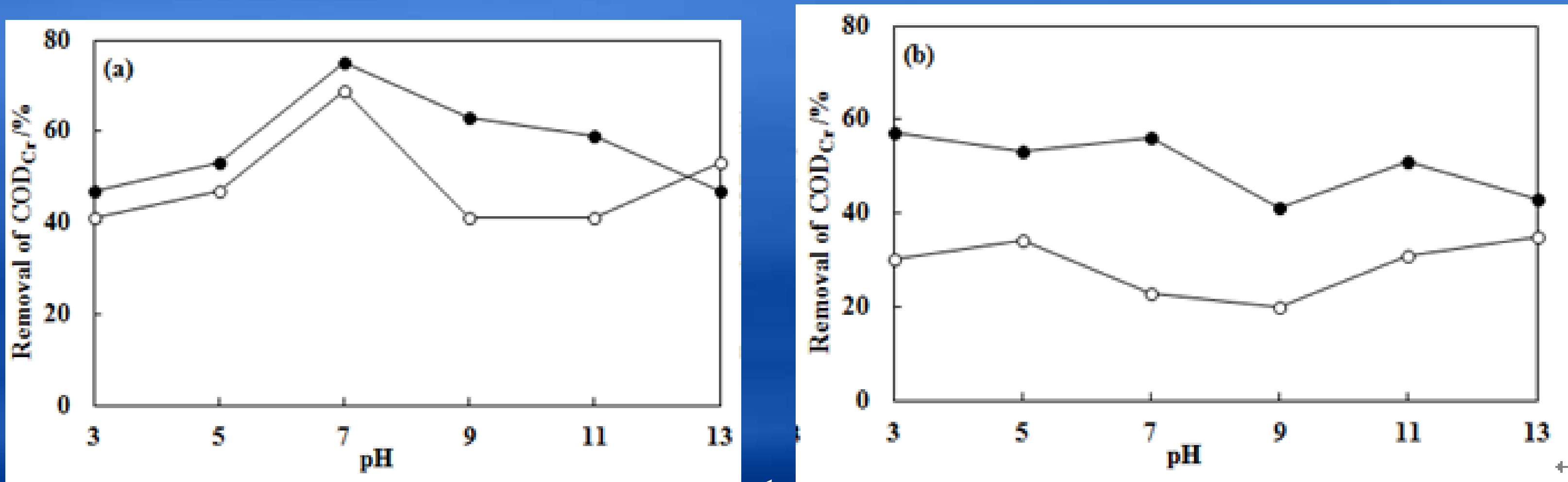


Fig.5 Influence of pH on removal of CO by M-PTF and PAC in treating (a) simulated dyeing wastewater and (b) sewage. Dosa mol/L for the simulated dyeing wastewater and 3 mmol/L for the sewage, respectivel d PAC (○). The error bars for all the data points represent the

M-PTF almost gave higher COD removal than PAC for the two types of wastewaters over the tested pH range.

2 Research results

Coagulation behaviour of M-PTF

Influence of coagulation pH

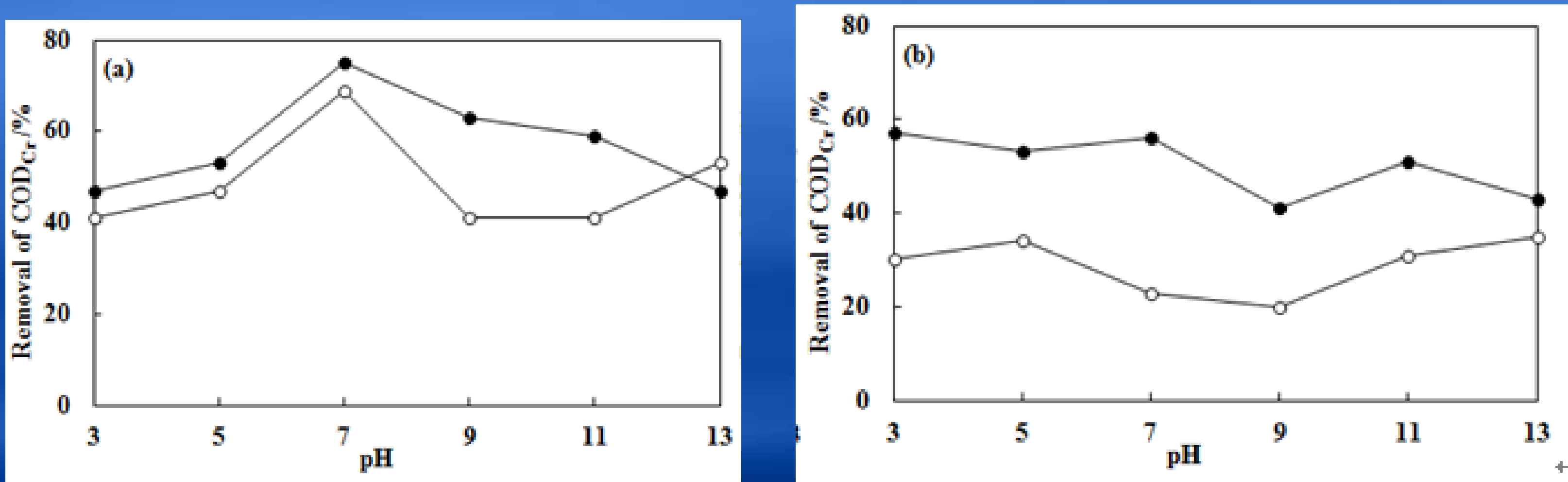


Fig.5 Influence of pH ... removal of COD_{Cr} by M-PTF and PAC in treating (a) simulated dyeing wastewater and (b) ...e. Dosage was 2mmol/L for the simulated dyeing wastewater and 3 mmol/L for the se... M-PTF (●) and PAC (○). The error bars for all the data points represen... eriments

For the simulated dyeing wastewater (Fig.5a), M-PTF achieved COD removal of 78% and 63% at pH 7 and 9.

2 Research results

Coagulation behaviour of M-PTF

Influence of coagulation pH

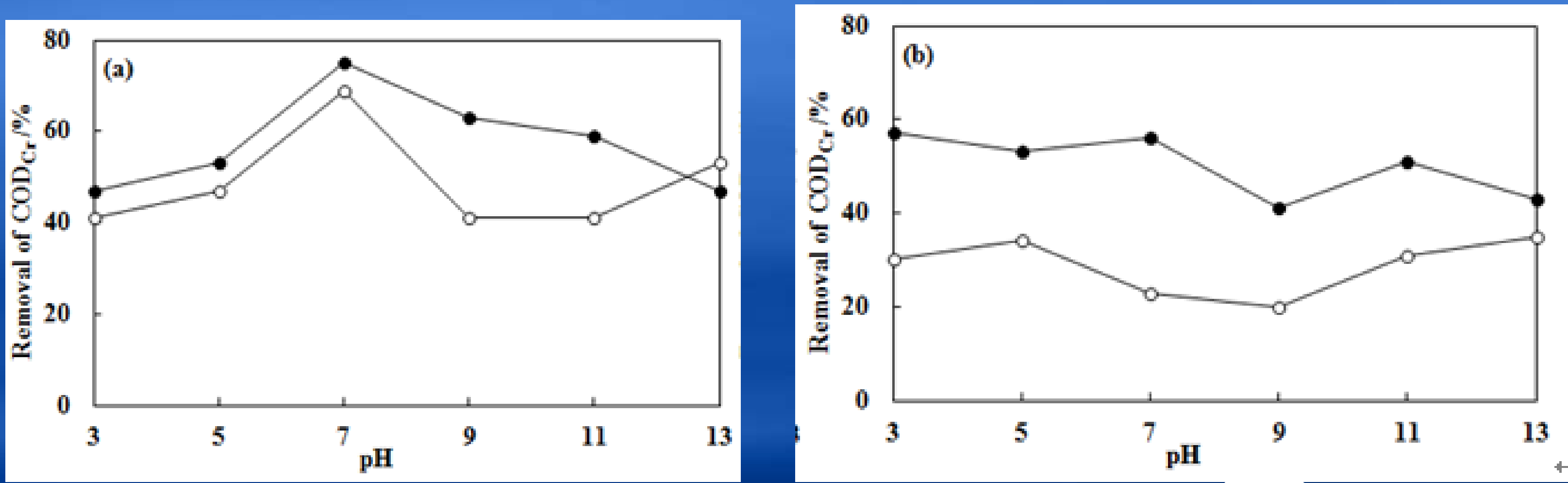
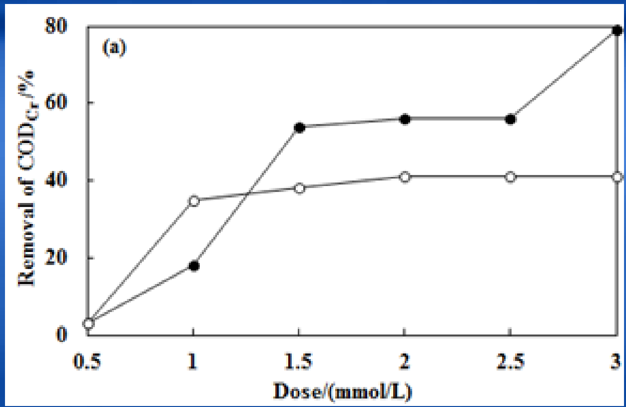


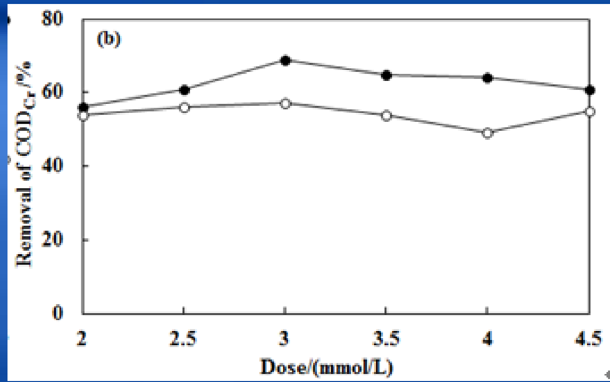
Fig.5 Influence of pH on removal of COD_{Cr} by M-PTF and PAC in tre… …mulated dyeing
wastewater and (b) sewage. Dosag… …mmol/L
for the sewage, respectively. M-PT…
represent the standard error of the …

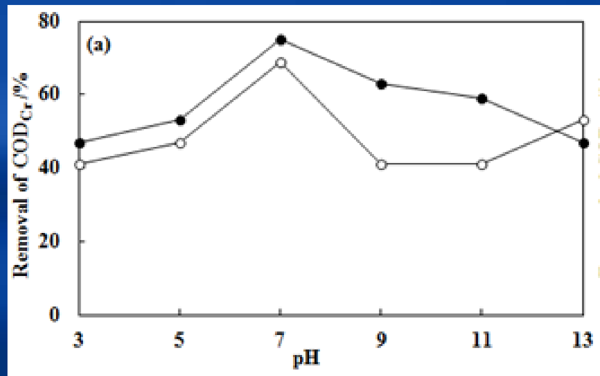
For the sewage (Fig.5b), the removal of COD by M-PTF achieved about 53, 56 and 51% at pH 5、7 and 11, respectively, more 29, 33 and 20% than PAC, respectively.

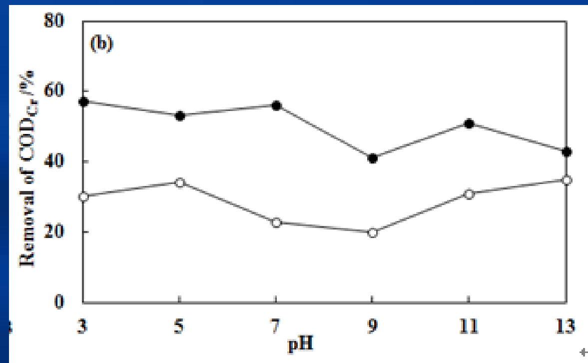
2 Research results

Coagulation behaviour of M-PTF





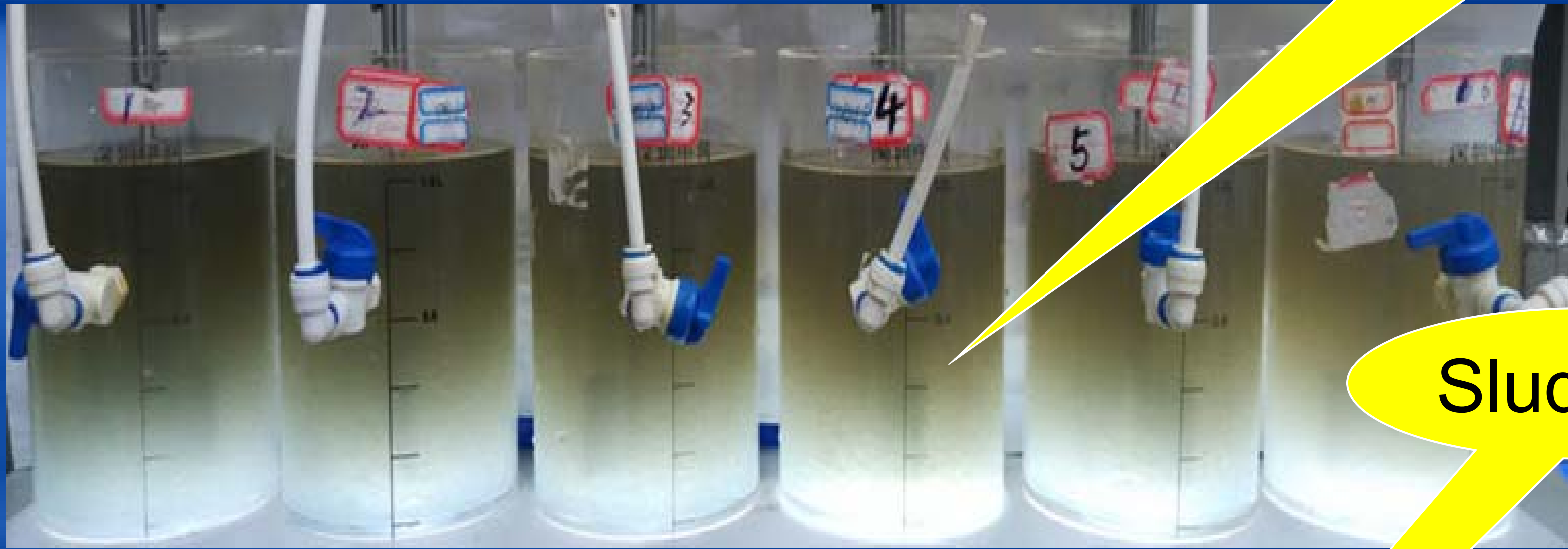




M-PTF can be adapted to a greater range of dosage at the same pH values and a wider pH range at the same dosages than PAC, which makes M-PTF have much more application significance in treating complex wastewater samples for organic matters removal.

2 Research results

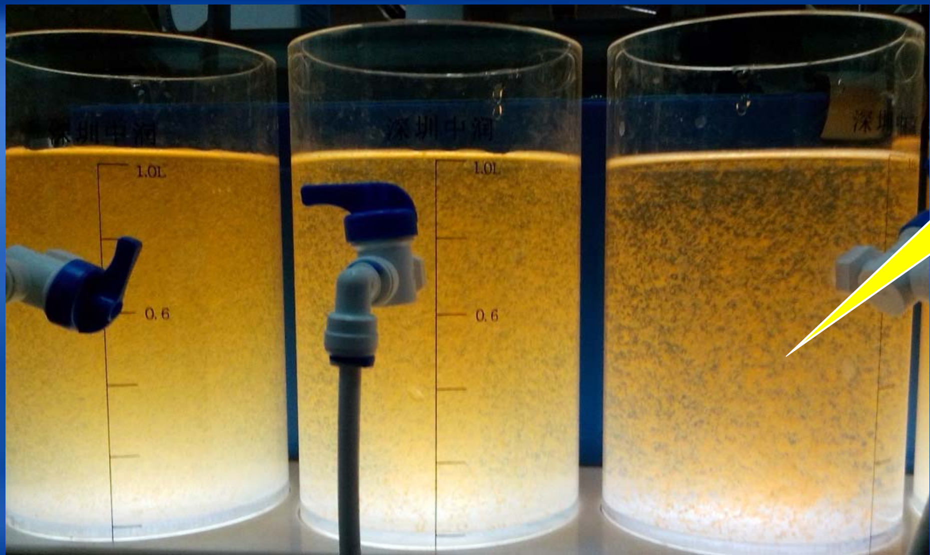
Coagulation b…



2 Research results

Coagul[illegible] f M-PTF

M-PTF: flocs



Sludge

3 Research conclusions

M-PTF prepared from WAFC is an excellent water treatment agent, and posed higher COD removal than PAC for different wastewaters at the tested pH and dosage ranges. So M-PTF can be adapted to a greater dosage range and a wider pH range than PAC.

M-PTF giving better removal of organic matters mainly depended on the complex micro-characteristics and the characteristics of hydrolysis products deduced.

Thanks

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