

# Study on the Degradation of Ceflor Masonry in Water by Ultrasonic Cavitation

Yuanyuan Liu, Yahui Shi

Shandong Xiehe University, Jinan 250107, China

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## Abstract

This paper compares the removal of the single ultrasonic cavitation effect and the addition of appropriate CCl<sub>4</sub> to the solution to strengthen the ultrasonic cavitation effect. The experimental results showed that the COD of cefkstone was decreased in both cases, but the ultrasonic cavitation effect alone takes a long time to degrade, while the CCl<sub>4</sub> enhanced ultrasonic cavitation effect takes a short time, and the degradation effect is obvious.

## Keywords

Wastewater Treatment; Antibiotics; Ultrasonic Cavitation; Cephalosporin.

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## 1. Introduction

Antibiotic wastewater is a kind of refractory and high concentration machine wastewater, its COD concentration is high, contains microorganisms difficult to degrade and even to microorganisms substances, water quality composition is complex, wastewater discharge is large and more direct discharge, seriously harm to the water environment. Do not number your paper: All manuscripts must be in English, also the table and figure texts, otherwise we cannot publish your paper. Please keep a second copy of your manuscript in your office. When receiving the paper, we assume that the corresponding authors grant us the copyright to use the paper for the book or journal in question.

Ultrasonic cavitation effect is a high-level oxidized water with more attention in recent years treatment techniques, especially for organic matter that is difficult to biodegrade. In dealing with in the process, the high energy generated by the collapse of the ultrasonic cavitation bubbles is enough to break the chemical bonds, the hydrogen oxygen radical (OH) and hydrogen radical (H), which some free radicals have strong oxidation, can efficiently oxidize organic matter in water into carbon dioxide, water, inorganic substances or destroy toxic groups on organic molecules, reduce the biotoxicity of organic matter. Studies of ultrasound cavitation effects are mostly focused in the treatment of pesticide wastewater, printing and dyeing wastewater, and the microbial inhibition is relatively strong the application of antibiotic wastewater is still less studied.

Cephalosporins are widely used clinically against bacterial infections class of drugs. cephalosporin is a derivative of cefinic acid, acid resistant and chemically stable, generally insoluble in water, the clinical application of cephalosporins is generally the head spononin sodium or potassium salts. Cefk masonry was used for experimental study.

## 2. Experimental Materials and Methods

### 2.1 Simulated the Configuration of Cephalosporin Wastewater

The cephalosporin used in this study was the head provided by Shandong Lukang Pharmaceutical group foxime disperse tablets, ground to powder, dissolved, filtered, and used as simulated wastewater.

## 2.2 Experimental Method for Simulating Cefixime Wastewater by Ultrasonic Radiation

Put cefk masonry solution to be treated into a custom laminated glass reactor in, open the ultrasonic cell grinder. This ultrasonic cell pulverder is pulse the flush working mode produces an ultrasound, which is worked for 30s and stops for 15s, and is therefore counted the reaction time of the solution is only the working time of the ultrasonic wave. The whole experimental outfit it is shown in Fig 1.

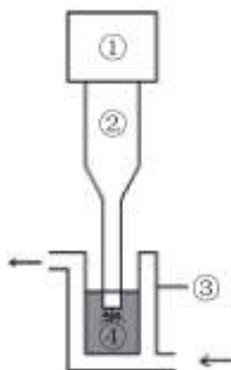


Fig. 1 Reaction device diagram

## 3. Results and Discussion

### 3.1 Ultrasonic Degradation of Ceflor Masonry Solution

At room temperature, 20 mg/L, cefk masonry solution was subjected to ultrasonic radiation. Cefk masonry solution was measured at regular intervals during ultrasonic radiation the COD value was calculated after the end of the experiment. As shown in Fig 2.

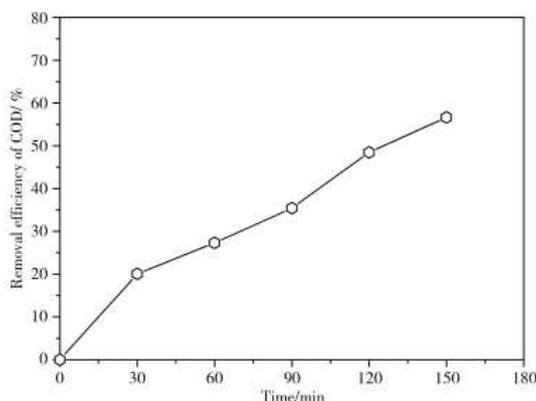


Fig. 2 Effects of ultrasonic cavitation effect on the COD removal rate of Cefock Masonry Solution

According to Fig 2, the longer the ultrasound reinforcement time, the decrease of cefk masonry solution the higher the solution rate, it is. This is due to the prolonged ultrasound cavitation in the reaction system the stronger the cavitation effect is, the more cavitation bubbles are produced, More the number of empty bubble, so the collapse system energy, the local high temperature and high pressure environment is more extreme, the more hydroxyl radical, so the decomposition of itself and hydroxyl radical strong oxidation of the probability also increased, therefore, the longer the ultrasonic radiation time, the COD removal rate is higher.

### 3.2 CCl<sub>4</sub> Enhanced Ultrasound Cavitation Effect on Degradation of Cefk Masonry

This experiment on the degradation of cefk masonry solution was carried out without the addition of different amounts of CCl<sub>4</sub>. The specific experimental results are shown in Fig 3. Fig 3 shows that CCl<sub>4</sub>

very effectively strengthens the degradation of cefk masonry solution by ultrasonic cavitation, and the degradation rate is greatly improved. Ultrasonic cavitation only radiated for 35min, and the degradation rate has exceeded 75%. After the addition of CCl<sub>4</sub>, CCl<sub>4</sub> has a strong volatile ultrasonic radiation, during which most of the CCl<sub>4</sub> gas molecules enter the interior of the cavitation bubble. At the moment the cavitation bubble burst, CCl<sub>4</sub> is decomposed inside the cavitation bubble, producing free radical Cl·, Cl· further conducts a series of recombinant reactions, producing a large number of active groups, and highly oxidized HClO·, Cl<sub>2</sub> and some chlorine-containing radicals (-Cl, -CCl<sub>3</sub> Cl), strongly attack cefk in aqueous solution, cavitation bubble and aqueous interface. Therefore, the degradation efficiency of the solution was significantly improved after the addition of CCl<sub>4</sub>.

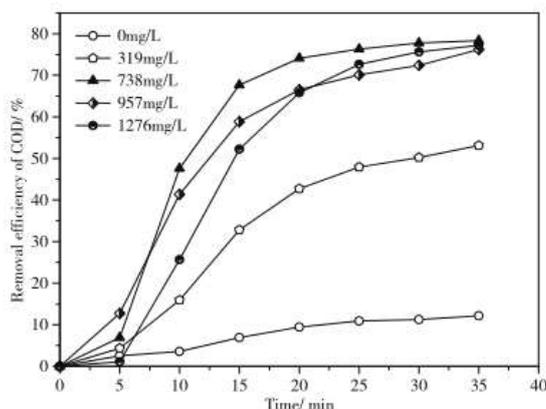


Fig. 3 CCl<sub>4</sub> enhanced ultrasonic cavitation effect for degradation of cefk masonry in water

### 3.3 Bioavailability Improvement

Many experiments have proved to effectively reduce the toxicity of organic matter in water, but fully mineralizing organic matter takes a long time and is expensive. However, it is theoretically feasible to use ultrasonic cavitation technology to pretreatment of organic matter, change the toxic group of organic molecules, reduce the toxicity of organic matter in water, improve the biochemical properties of wastewater, and then carry out biological treatment. In this experiment, 80 mg/L of cefk masonry solution was radiated by ultrasound, and a certain amount of solution was measured for BOD<sub>5</sub> and COD at regular intervals, and then calculated. As shown in Fig 4.

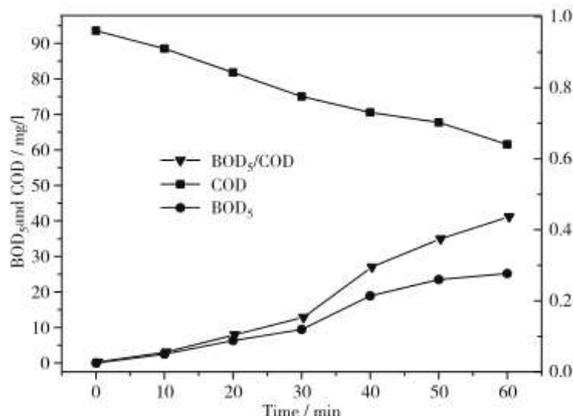


Fig. 4 Effect of ultrasonic cavitation on bioability of cefk masonry

According to Fig. 4, the biochemical ability of cefk masonry solution is significantly improved after a certain period of ultrasonic radiation. After 1h of ultrasonic radiation, the COD removal rate of cefk masonry solution was 34.2%, which was not fully mineralized, but BOD<sub>5</sub> increased from 0.0mg/L to 25.20mg/L, while BOD<sub>5</sub>/COD increased from 0 to 0.41. It fully shows that the molecular structure

of cefk masonry is destroyed, and some intermediates that are prone to biodegradation are generated, the bioavailability is improved, and the conditions that can be biotreated have been reached.

#### 4. Conclusion

The ultrasonic cavitation effect can convert cefk masonry in solution and significantly improve the bioavailability of cefk masonry solution. However, ultrasonic radiation degradation of cefk masonry solution alone is time-consuming and has a high economic cost. Adding a small amount of CC14 to the reaction system, the mineralization effect was very good. The removal rate of 0.5h reached nearly 80%, and the value of 80 mg/L BOD5 / COD was increased from 0 to 0.41, reaching only 60min, greatly saving economic cost and providing a feasible basis for the application of ultrasonic radiation in biological treatment.

#### Acknowledgments

Shandong Provincial University of Science and Technology Plan Project. Project name "Study of cephalosporin in water by ultrasonic cavitation effect" + Project number.: KJ2018BBD018.

#### References

- [1] Lv Weilu, Huang Yun, Liu Fei. Preliminary Exploration of "Project" Teaching Reform Model of Environmental Art Design-Take the direction of Interior Design as an example. *Ornament*. Vol. 42 (2019) No. 14, p. 231-236.
- [2] Liao Ping, Chen Bo, Yang Yunfang. Talent Training Thoughts of Undergraduate Vocational Education-Take "20 Vocational Education" leading the pilot landscape garden major as an example. *Journal of Ningbo Vocational and Technical College*. Vol. 23 (2020) No.1, p. 132-137.
- [3] Zhang Yamin. Innovation and entrepreneurship talent training and art and design professional practice teaching mode innovation. *Art Research*. Vol. 42 (2020) No. 04, p. 245-249.
- [4] Hu Hongying. Reform of Environmental Art Talent Training Mode under the Background of Innovation and Entrepreneurship- Take Advertising Major of Minnan Normal University as an example. *Innovation and entrepreneurship education*. . Vol. 12 (2019) No. 02, p. 98-103.