

Study on the determination of solubility of ozone in pure water during the treatment of ozone water quality

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Abstract

In recent years, with the national awareness of environmental protection gradually improved, the relevant government agencies in order to protect the national safety and health diet, through the addition of ozone in the water to achieve water treatment, food processing and related medical and health fields. This paper mainly analyzes and studies the detection methods of ozone solubility in pure water. At present, there are many kinds of detection methods for ozone concentration in water in China. Conventional detection methods include iodine quantity method, colorimetric method, ultraviolet spectrophotometry and so on. Different detection methods are suitable for different detection environments. It is necessary to conduct analysis and research according to the actual environment of the inspection site and select the most suitable detection method.

Keywords

Ozone; Ozone solubility; Determination method; Concentration detection.

1. Common determination methods in the process of ozone water treatment

In recent years, ozone has become a common disinfectant with strong oxidant in our market and is widely used in sewage treatment. Food processing; Medical devices and so on. Enterprise operating personnel when on the ozone, need according to the analysis on the actual situation, and determine the optimum on the concentration of ozone if put on the concentration is too low, not only in the process of processing for the water treatment time and treatment effect is not obvious, if put in the high concentration of ozone, not only waste the cost but also can lead to water body caused by a series of side effects, such as: produce water hua and so on. In this paper, the methods for detecting ozone concentration are analyzed and studied, and the iodine content method, colorimetric method and ultraviolet spectrophotometry are briefly discussed. The characteristics, measuring principle and application environment of the detection method are analyzed and described.

1.1. Iodine quantity method

1.1.1. Measurement principle

The researchers took an appropriate amount of water containing ozone and poured an appropriate amount of iodide into the water sample. Iodide reacts with ozone to oxidize solid iodine, which is then reduced to oxygen. Therefore, we can conclude that after ozone dissolved in water, adding iodide, 1 mole of ozone will oxidize 1 mole of iodine.

1.1.2. Measurement method

The researchers' first iodide was a solution of potassium iodide, which breaks down iodine atoms when poured into a water-soluble ozone solution. After the complete reaction, the experimenter poured sodium sulfate into the solvent after the reaction to conduct acidification

reaction on the solution. According to the acidification reaction, the solution could be determined to contain lakes. The concentration of ozone in the solution was calculated based on the sodium sulfate solution content.

1.1.3. Features and applications

Iodimetry is easy to operate and does not involve the use of other expensive experimental equipment and instruments. In addition, the accuracy of ozone concentration detection is relatively high. However, as the operation process is manual, operators are required to have rich experimental experience and the operation process is rigorous, so the experiment cannot be carried out continuously. Operators should avoid being affected by other oxides during the experiment to affect the experimental results. The iodine content method is mainly used to detect the ozone concentration in the experimental detection process and in the production process.

1.2. Colorimetric method

1.2.1. Measurement principle

Colorimetric method is mainly used to judge the range of ozone concentration according to the reaction between ozone and different reagents, which produces different effects. At present, our country uses potassium iodide reagent to detect the ozone concentration in the water to be measured, and compares the color change of the solution after the test with the sample solution, so as to judge the ozone content in the water.^[1-2]

1.2.2. Measurement method

Before the experiment, the operator needs to make a reference color plate. The color plate is composed of six colors, representing the different colors formed by the reaction between different concentrations of ozone and potassium iodide reagent. The colors are arranged from light to dark at one time. During the experiment, operators were required to add quantitative potassium iodide into the water to be measured. When the water changed color, the ozone concentration in the water to be measured was detected by comparing the colors in the reference color plate.^[3]

1.2.3. Features and applications

Since the operator can compare the ozone concentration in the solution to be measured according to the color on the reference color plate, this detection method has certain error, and the reference color plate cannot be saved, so the operator needs to adjust it before the experiment. However, colorimetric method has the characteristics of simple operation steps, small experimental equipment, easy to carry, low experimental cost and so on. It can be used to inspect the measured water anytime and anywhere. However, colorimetric method has higher requirements on light factors and color sensitivity factors in the process of water detection. Therefore, operators can improve the accuracy of detection by using intelligent technology.

1.3. Uv spectrophotometry

1.3.1. Measurement principle

Ultraviolet spectrophotometry means that the light beam is absorbed by some gas or liquid in the medium when it passes through some medium in the process of propagation. Ultraviolet light can absorb light waves of 200~300nm, while ozone has a wavelength of 253.7nm.

1.3.2. Measurement method

In general, ultraviolet rays have a bicolour method, and have light and temperature effects. The effect of light and temperature can be used to detect the ozone concentration in the measured water body and read out the accurate ozone content. After comparing and analyzing the ozone absorption signal with the absorption signal of the light column, the ozone concentration in the measured water body can be obtained.

1.3.3. Features and applications

Although UV spectrophotometry has the characteristics of high stability, high precision, continuous treatment of the measured water, and no influence from other oxides, the experimental facilities and equipment involved in the experimental detection process are too expensive to be widely used in the enterprise detection process. Ultraviolet spectrophotometry is suitable for online detection of large reservoirs.^[4]

2. The results

Table 1 Comparative analysis of the advantages and disadvantages of the detection methods

In this paper, through the analysis and study of the above three detection methods for the determination of ozone concentration in water, it can be found that the iodine quantity method has the characteristics of high efficiency, fast, convenient and improve the experimental efficiency. The colorimetric method is characterized by simple operation steps, small experimental equipment, easy to carry and low experimental cost. Uv spectrophotometry has the characteristics of high stability, high precision, continuous treatment of the water, not affected by other oxides and so on. Therefore, this paper compares the advantages and disadvantages of the three measurement methods, as shown in Table 1 below.

Table 1 Comparison and analysis of detection methods

	Iodine quantity method	Colorimetric method	Ultraviolet spectrophotometry
advantages	High efficiency, fast, convenient, improve the experimental efficiency	Simple operation steps, small experimental equipment, easy to carry, low experimental cost	High stability, high precision, continuous treatment of water testing, not affected by other oxides
disadvantages	Manual operation, unable to carry out continuous experiments, easy to react with other oxides	Requirements for light factors and color sensitive factors are higher	The cost of laboratory equipment is too high

2.1. Analysis and comparison of testing sites

It is found that the iodine quantity method is suitable for the detection of ozone concentration in the production process. The colorimetric method is suitable for the detection of ozone concentration in water anytime and anywhere. Ultraviolet spectrophotometry is suitable for the detection of ozone concentration in large reservoirs. Therefore, this paper analyzes and studies the places where these three detection methods are applied, as shown in Table 2 below.

Table 2 Analysis and comparison of test sites

	Iodine quantity method	Colorimetric method	Ultraviolet spectrophotometry
Detection place	In the production process	Anytime and anywhere	Large reservoirs

3. Conclusion

In this paper, through the analysis and study of different methods for the determination of ozone concentration in water, it can be found that according to the different water environment to be tested, the methods for the determination of water are different. In this paper, three determination methods of iodine quantity method, colorimetric method and ULTRAVIOLET spectrophotometry are analyzed. It can be found that iodine quantity method is suitable for the determination of ozone concentration in the process of technology or experiment, while colorimetric method is suitable for the determination of large quantities of water. Ultraviolet spectrophotometry is suitable for the determination of large water sites. Therefore, in order to meet the requirements of better determination of ozone concentration in different places and environments, researchers need to constantly improve the determination method of ozone, so that the determination method can be better applied in industry and life.^[5-6]

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