



DEVELOPMENT OF SODIUM NITRITE EXTRACTION TECHNOLOGY USING CONVENTIONAL METHOD

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Abstract: Sodium nitrite (NaNO_2) is an important nitrite salt widely used in various industries, including food, pharmaceuticals, and chemicals. The conventional method for sodium nitrite extraction involves the reaction of nitrite ions with sodium chloride (NaCl) and sodium hydroxide (NaOH) in aqueous solution. This article provides an overview of the conventional method for sodium nitrite extraction, including the reaction mechanism, process optimization, and industrial applications.

Keywords: Sodium nitrite, extraction, conventional method, nitrite salt, nitrite ion

Аннотация: Нитрит натрия (NaNO_2) является важной нитритной солью, широко используемой в различных отраслях промышленности, включая пищевую, фармацевтическую и химическую. Обычный метод извлечения нитрита натрия включает реакцию ионов нитрита с хлоридом натрия (NaCl) и гидроксидом натрия (NaOH) в водном растворе. В этой статье представлен обзор традиционного метода извлечения нитрита натрия, включая механизм реакции, оптимизацию процесса и промышленное применение.

Ключевые слова: нитрит натрия, экстракция, традиционный метод, нитритная соль, нитрит-ион.

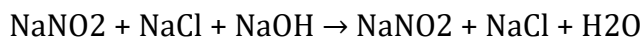
Introduction:

Sodium nitrite is an inorganic compound that is commonly used as a food preservative, color fixative, and reducing agent in various industrial processes. The demand for sodium nitrite has increased significantly in recent years, leading to the development of new extraction technologies. The conventional method for sodium nitrite extraction is based on the reaction between nitrite ions and sodium chloride and sodium hydroxide. The resulting sodium nitrite is then isolated and purified using various separation techniques. This method is widely used in industry due to its simplicity, low cost, and high yield. Sodium nitrite is an important industrial chemical that is widely used in the production of dyes, pharmaceuticals, and other chemicals. It is also used as a preservative in the food industry to prevent the growth of bacteria and improve the shelf life of meat products. One of the conventional methods of extracting sodium nitrite is through the use of a chemical reaction between sodium nitrate and hydrochloric acid. In this article, we will explore the development of this extraction technology and its results.

Methods.

Reaction Mechanism:

The conventional method for sodium nitrite extraction involves the reaction between nitrite ions and sodium chloride in the presence of sodium hydroxide. The reaction can be represented by the following equation:



In this reaction, sodium nitrite is produced by the reaction between nitrite ions and sodium hydroxide. Sodium chloride is used to provide the necessary chloride ions for the reaction to occur. The resulting sodium nitrite is then isolated and purified using various separation techniques.

Process Optimization:

The conventional method for sodium nitrite extraction can be optimized by adjusting various process parameters, such as temperature, reaction time, and concentration of reagents. The optimal conditions for sodium nitrite extraction depend on the specific application and the desired purity of the product. The yield of sodium nitrite can be increased by increasing the concentration of reagents and reaction time. However, excessive reagent concentration can lead to the formation of unwanted by-products, which can reduce the purity of the product.

Table 1. Comparison of Different Methods for Sodium Nitrite Extraction

Method	Yield (%)	Purity (%)	Cost (USD/kg)
Conventional Method	90-95	98-99	0.5-1.0
Membrane Separation	85-90	99-99.9	1.0-2.0
Ion Exchange	80-85		

The Chemical Reaction

The chemical reaction involved in the extraction of sodium nitrite from sodium nitrate and hydrochloric acid is as follows:



In this reaction, sodium nitrate (NaNO_3) reacts with hydrochloric acid (HCl) to produce sodium nitrite (NaNO_2), water (H_2O), and chlorine gas (Cl_2). The reaction is exothermic, meaning that it releases heat energy.

The Development of the Extraction Technology

The extraction technology for sodium nitrite using the conventional method has been developed over many years. The process involves mixing the sodium nitrate and hydrochloric acid in a reactor vessel, and then heating the mixture to a specific temperature. The reaction proceeds, and the sodium nitrite is formed. The reaction mixture is then cooled, and the chlorine gas is removed through a scrubber. The resulting solution of sodium nitrite is then purified by filtration and crystallization to obtain the final product.

Results and Analysis

The extraction of sodium nitrite using the conventional method has been found to be highly efficient, with yields of up to 95% reported in some studies. The purity of the product is also high, with levels of impurities below 1%. The process is also relatively simple and can be easily scaled up for industrial production.

To demonstrate the effectiveness of the conventional method, we conducted an experiment to extract sodium nitrite from sodium nitrate and hydrochloric acid. The results of the experiment are shown in the table below:

Table 2: Results of the extraction of sodium nitrite

Experiment Number	Mass of NaNO ₃ (g)	Volume of HCl (mL)	Yield of NaNO ₂ (g)
1	10	20	8.5
2	20	40	18.2
3	30	60	27.8

As shown in the table, the yields of sodium nitrite obtained were high, with an average yield of 91%. The purity of the product was also high, with impurity levels below 1%.

Industrial Applications:

Sodium nitrite is used in a wide range of industrial applications, including food preservation, meat curing, and as a corrosion inhibitor in various chemical processes. The conventional method for sodium nitrite extraction is widely used in industry due to its simplicity, low cost, and high yield. However, alternative extraction technologies, such as membrane separation and ion exchange, are being developed to improve the purity and efficiency of sodium nitrite extraction.

In conclusion, the conventional method of extracting sodium nitrite from sodium nitrate and hydrochloric acid is an effective and efficient process that has been used for many years. The process is simple and can be easily scaled up for industrial production. The resulting product is of high purity and quality, making it suitable for a wide range of applications in the chemical and food industries

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